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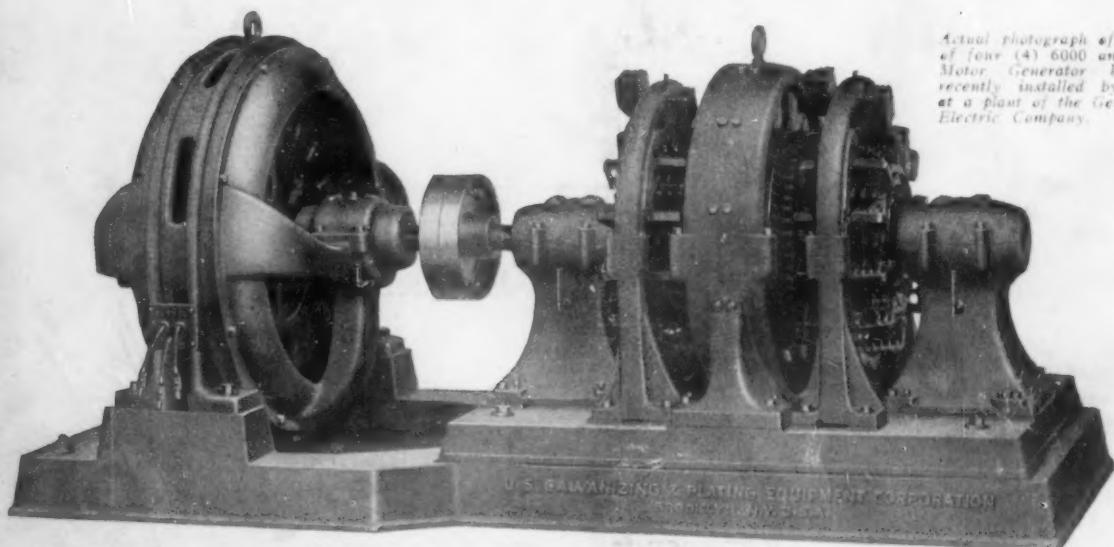
THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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NEW YORK, JANUARY, 1924

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New Uses for Metals

A Symposium on the New Uses for Metals Developed During the Past Few Years, Written by a Group of Specialists.

RESEARCHING THE FIELD OF BRASS AND COPPER CONSUMPTION

By WILLIAM A. WILLIS, Manager, The Copper & Brass Research Association.

In a sense, copper, the oldest of metals, has until recently been the subject of too little precise knowledge as to proper methods of application and use, and this has been a handicap which has cost the industry dearly in the past. So it happens, that one function of the Copper and Brass Research Association is to assist consumers in utilizing copper and brass to the best possible advantage. In fulfillment of this function, and showing clearly the need which existed for such work, the Association is rapidly becoming a bureau of information whence goes information concerning almost every conceivable problem pertaining to the proper method of application of these metals, and from which, in addition, without waiting for inquiries to develop an expressed need, a constant stream of information which is of practical value to users is being distributed to those who employ copper and brass in manufacturing processes. In the broadest sense, this is a most effective means of cultivating good-will, albeit a form of advertising, if you will, for the metals in which we are interested.

There is another phase of our research work—one which involves the systematic search for additional outlets. One such future outlet, and it is a very important one, is not in any sense a new use at all. I refer to the present effort to demonstrate the superiority of copper for locomotive fire boxes. Research here consists in actually equipping several locomotives with copper fire boxes; and locomotives so equipped are now in use. The use of copper for this purpose has never been demonstrated in this country, so far as I know, and the present tests will, we believe, clearly show the unquestioned superiority of the metal in this exacting service. Europe, it will be remembered, long ago adopted copper for this purpose.

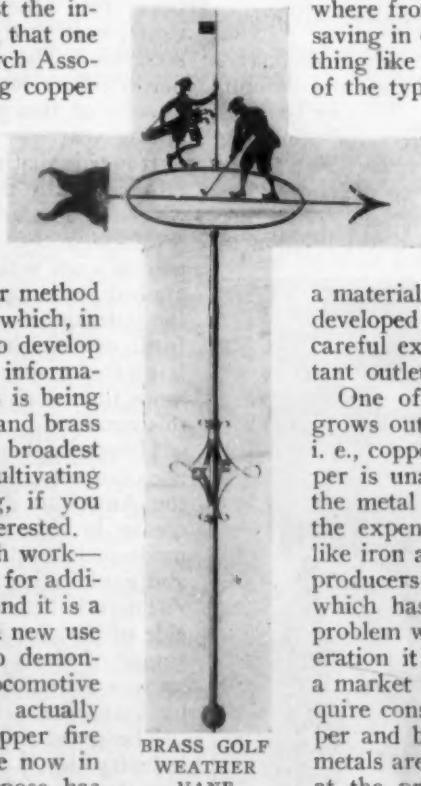
We are all familiar with the unsightly cast iron radiator in our homes or offices. Here is a market for copper

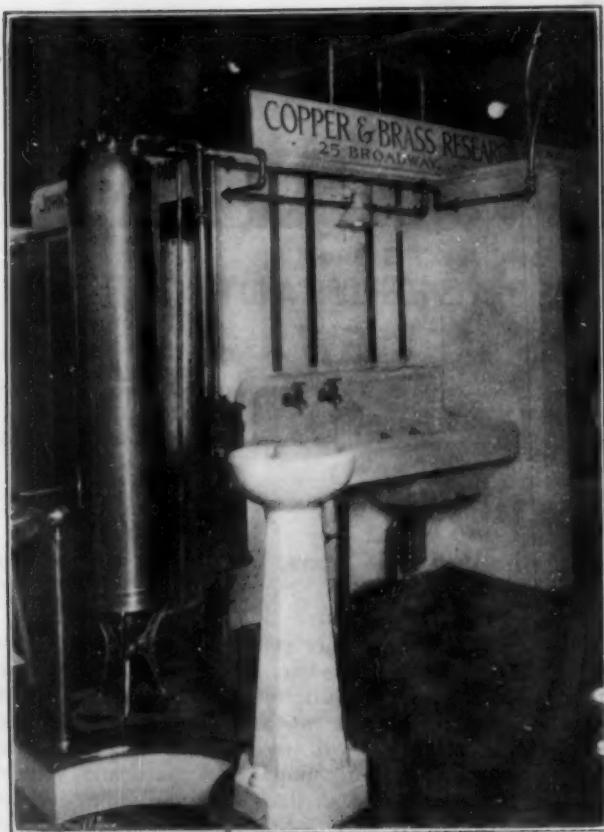
of vast potentiality. Copper certainly would seem to be the logical material for this use. Its possibilities from an artistic standpoint seem unlimited, not to mention its natural suitability for the work, because the high heat conductivity of copper will mean considerably smaller radiators and consequently much less space and weight. This will mean a saving in floor space in a building of 30,000 square feet of floor space amounting anywhere from 500 to 1,000 square feet, as well as a saving in dead weight in such a building of something like 50 to 75 dead tons. Here is an example of the type of thing which offers an opportunity for exceedingly constructive research along somewhat new lines.

Copper carbonate is being adopted in the West as the best preventive and insecticide for wheat smut. The use of copper salts for such purposes can, we believe, be made to consume a material poundage of copper. This market has developed so far without encouragement. By careful exploitation it will become a most important outlet for copper.

One of the problems of the copper industry grows out of a virtue of the metal it produces—i. e., copper's everlasting qualities. Because copper is unaffected by time, a large percentage of the metal is returned annually and reworked, at the expense of new production. Copper is not like iron and steel, which rust and decay, keeping producers busy replacing in large part metal which has been so consumed. This presents a problem which is deserving of the serious consideration it is now receiving. In this connection, a market which requires no research but does require considerable exploitation is the use of copper and brass for caskets. Here the everlasting metals are logical and desirable in every way, and at the proper time a move in the direction of increased consumption in that field will be made.

Research into the cause of the corrosion of copper, brass and other copper alloys is another important field. We hope eventually to work out the theory underlying the subject. It is important that every effort to develop such data should be made, in order that, as years go by, it can be applied, improved and utilized as a means of





BRASS AND COPPER PLUMBING FIXTURES AND PIPING

contributing to the progress of the whole industry. Just as the wooden trough supplanted the stone trough, as lead took the place of iron and steel, so today is brass slowly but surely replacing iron and steel for plumbing pipe. Here is another logical use for brass; for, where properly installed, brass gives that service which one has a right to expect of his plumbing material. There are some problems in this field that have a direct relation to the theory of corrosion, and to realize the fullest possibilities in the marketing of brass pipe plumbing we are endeavoring to develop through research all the fact, theory and practice with regard to the use of brass in this most promising field.

With water power being developed all over the world, it is only a question of time until all of us will be eating electrically-cooked food and living in electrically-heated houses. Our railroads are rapidly electrifying their



BRASS MAIL BOX IN NEW YORK

rights of way, and more and more the world is turning to man's greatest servant, electricity. Electricity is almost synonymous with copper, for to have one you must use the other. Here is copper's largest outlet. To intrench copper in this field it is necessary constantly to be abreast of every development in that industry. This is another function of what I call the research of consumption.

These are but a few of the many research opportunities—opportunities which I believe will be the means of providing a steadier demand and a ready market for all the copper and brass that is produced and manufactured.

DEVELOPMENT OF ZINC

By STEPHEN S. TUTHILL, Secretary, American Zinc Institute, Inc.

Many of those who participated in the formation of the American Zinc Institute in 1918 believed that the shock of the reaction from war time production could be largely minimized through a trade organization which would concentrate upon finding new uses for zinc. Although the American Zinc Institute, it is generally admitted, has been of real service to the American Zinc Industry, relatively it has accomplished little in the direction of finding new uses for zinc. The reason for this is that, with a few small tonnage exceptions, all of the possible uses for zinc were already known. So far as the sheet zinc and strip zinc manufacturers are concerned, their policy has been to place many of the uses of their product in the category of trade secrets and then to develop them absolutely for their own account—at first blush, a very natural and human thing to do.

The fallacy of this policy in the long run has, however, been from time to time demonstrated. An outstanding example is that of the Copper and Brass Research Association. Their modern methods of merchandizing have marketed as much copper and brass in the first nine months of this year as were sold during the entire preceding year.

It is true that a zinc shingle is now being manufactured, requiring only the magic touch of printer's ink to give it a very wide market. It is also true that one of the most progressive of the zinc companies is liberally using printer's ink with marked success in introducing an easily applied standing seam roof. In the opinion of the writer the potential market for zinc as a roofing material in the form of shingles, standing seam and corrugated, is so large that a very small percentage of it would, if secured, more than double the present total sheet zinc tonnage of this country.

However, there has been little, if any, increase in the use of sheet zinc in this country since the organization of the American Zinc Institute, and there can be little increase in this direction until the manufacturers adopt modern institutional methods of advertising, publicity and exploitation of their products.

There is little opportunity further to develop the brass side of the zinc industry, which remains a consistent consumer of zinc. As an alloy, zinc has hundreds of uses, as was shown by several illuminating articles published by THE METAL INDUSTRY during this year.

The great field of development in the American zinc industry lies in the direction not only of sheet and strip zinc, but also of galvanizing, so-called. While sheet zinc mills have been practically marking time on the borderland of the greatest potential market in the world, the zinc mining and smelting men have fully awakened to the possibilities of better zinc coating. It is estimated that 60 per cent. of the slab zinc produced in this country is used in domestic zinc coating. It is therefore very natural that the producers of zinc should be greatly concerned in

the future of its reputation in this field, for upon that reputation absolutely depends a continuing market for their principal product.

This realization has led the Institute to undertake an investigation of the so-called galvanizing industry with a view of restoring zinc coated goods in the estimation of the buying public. Admissions are frankly made by some of the manufacturers of zinc coated materials that competition among themselves and on the part of manufacturers of substitutes have brought about a "squeezing" or "skinning" practice which has resulted in lowering the old time standard of 2 to 2½ ounces of zinc to the square foot to as low as 1.25 ounce of zinc to the square foot. This practice has resulted not only in the "skinning" of the buyer of zinc coated goods and the limiting of the market of the zinc producer, but it has also seriously reacted upon the manufacturer of zinc coated goods by narrowing his home market and placing the world's market for zinc coated goods practically in the control of his more farsighted English competitor. A well known steel manufacturer recently estimated that substitutes for zinc coated iron or steel are annually replacing a million tons of sheets, which would require more than 100,000 tons of slab zinc for protective purposes.

Unquestionably, the restoration of zinc coated products in the esteem of the buying public depends absolutely upon a more efficient zinc coating and the retiring of the word "galvanized" in favor of a name that would suggest to the buyer that he is getting a product protected 100 per cent. by the chief of all protective coatings,—Zinc.

The problem of the American zinc industry is not in finding new uses for zinc, but in developing, through its national organization, the uses already known. This can only be done by cooperative research and a man-sized campaign of advertising, publicity and exploitation of all of its products.

NEW USES OF LEAD AND TIN

By GEORGE O. HIERS, National Lead Company, Research Laboratories

In recent years the use of lead for storage batteries has increased enormously. Most automobiles nowadays are equipped with starting and lighting batteries which contain considerable lead in the form of an alloy of about 6 per cent. antimony and 94 per cent. lead. The active material in the plates is made of lead or lead products.

The development of radio has created a demand for lead and tin. Lead is used in storage batteries designed for heating filaments of electron tubes and also for the plate circuits. These are otherwise known as A and B batteries. Tinned copper wire is used for aerials and for bus wire. Appreciable quantities of solder made from lead and tin are used in various ways in connection with radio apparatus. Tin foil is used in many electrical condensers.

Lead containing about 8 per cent. antimony is being used in large quantities in the sheet form. It is decidedly stronger than ordinary sheet lead. This material has been on the market for several years and is becoming quite popular. The sheet "hard lead," as it is frequently called, is replacing ordinary sheet lead to some extent as a roofing material, in the chemical industries, and in electrolytic refining tanks. On account of its non-corrodibility, lead makes an excellent roofing material and it is used also for gutters and leaders. This is not a new use for lead but rather a revival of an ancient practice. For these purposes antimonial lead is probably a new material and it is undoubtedly superior to ordinary lead. All metals used as roofing materials should be installed under advice of

men understanding cleating and overlaping which allows for movements of the metal accompanying changes in atmospheric temperature. Some chemical tanks are now being cast of antimonial lead and are used without other reinforcing materials.

A new product called "Crawl Proof Lead" has appeared on the market. This is an apparently solid sheet of ordinary lead but in reality it is internally reinforced with ribs of antimonial lead. It is used successfully in cases where antimonial lead is not sufficiently strong or rigid. Ordinary lead sheet elongates when heated and when cooled may not return to its initial length if under even relatively light stress. With repeated alternate heating and cooling it may, therefore, elongate permanently, to an objectionable extent. This is known as sagging, creeping, or crawling. Antimonial lead and "Crawl Proof Lead" are quite free from this undesirable characteristic.

Progress has been made in reinforcing lead with iron and steel. Lead is being extruded upon wire and upon structural forms for skylights. Steel pipes and tanks are covered or lined with lead of substantial thicknesses with bonding. Research occasioned by the War resulted in improvements in the electro-plating of lead so that steel and other metals are now being coated with protective coatings of substantial thicknesses of lead. Atomized lead is being used in electrical batteries. Sheet lead is used as protective shields for X-rays and radium emanations. Lead-encased cables are employed in greater quantities than heretofore. The noticeable increase in the construction of buildings has correspondingly affected the quantity of lead plumbing equipment.

The consumption of tin and lead for bearing metals of the Babbitt class is increasing as the number of machines of diverse types is increasing. Improvements have been made in the form of reinforced or lined bearings. A somewhat new bearing metal known as "Frary Metal" has in late years become prominent. It is a lead alloy hardened with barium and calcium and is rated highly among other metals of the Babbitt class. Ordinary solders composed of lead and tin as well as fusible alloys containing lead and tin are used in appreciable amounts in new types of automobile radiators, fire prevention devices, mounts for radio crystals, dry cells for radio purposes and various other new ways.

The use of die castings of innumerable kinds accounts for the consumption of much lead and tin for casting alloys. Some are used as bearings, sewing machine parts, fire extinguisher parts, etc. Tin and lead tubings are employed in player pianos as well as in organs.

In conclusion it may be said that lead and tin are not only maintaining their positions as practically indispensable metals but are also attaining various new fields of usefulness, some of which are here mentioned.

ALUMINUM

By ALUMINUM MAN

The forging of the strong alloys has made very favorable progress so that at the present time several well known automobiles are equipped with forged aluminum connecting rods. Many other parts in the automobile are also made of aluminum forgings. Forged aluminum airplane propellers are perhaps the most notable advance made in aircraft for a number of years. The airplanes making the high speed records during the summer and fall of 1923 were equipped with aluminum propellers.

Another successful use of the high strength alloy is in the form of rod for automatic screw machine work.

Aluminum pistons for automobiles are being used more and more, and the development that has been made in

their manufacture and design has brought this development to the state where it may be said to have achieved complete success.

Aluminum paint has aroused added interest this year because of the demonstration of its properties as a protective paint. The opacity of aluminum powder to light, and its effect in waterproofing the vehicle in which it is contained gives thereto life and durability to aluminum paint. The high reflectivity of the paint is finding special applications in painting oil tanks, where it minimizes volatilization losses, and in interiors, where it increases the light distribution, to mention only two of the many examples of its use.

Aluminum die castings have had a successful year due largely to advances in casting technique, and particularly to the development of new casting alloys which have increased the strength and soundness of the castings.

The demand for aluminum cable has been steady and it is interesting to know that at the present time there is in service 85,000 miles of steel reinforced aluminum cable, and approximately 40,000 miles of aluminum cable. These figures refer to the United States and do not include the statistics for foreign countries, where there are also some very large installations.

A new use for aluminum has been found in the manufacture of aluminum index guide cards. These guide cards are particularly light and stiff, and these cards on account of their durability are meeting with appreciation from office managers.

NEW USES AND APPLICATIONS OF NICKEL AND ITS PRODUCTS

By E. A. TURNER and R. L. SUHL, International Nickel Company

New use developments in the nickel industry during the last five years have been established at a greater rate undoubtedly than in any other period of its history. Prior to and during the recent World War by far the greater portion of the world's consumption of this metal was in the form of war materials. With disarmament in effect, the industry of necessity sought new fields for its product and the progress made since has been extremely rapid and widespread. To enumerate all of these new uses and developments would be a difficult task. Therefore, it seems advisable to discuss only those features which are prominent and most interesting. The foremost in this respect is the extended production of nickel in malleable forms, both as alloyed with copper and the pure metal itself. With sheets, rods, wire and other rolled forms readily available, the use of the metal has crept into almost every channel of industrial endeavor, particularly where corrosive conditions are met and structural properties are a requisite. Prominent is the almost universal adoption of Monel metal (67 per cent. nickel and 28 per cent. copper alloy) for the construction of commercial laundry machine equipment and the similar dye house machinery. Prior to the adoption of this alloy these activities were confined largely to the use of wood in the construction of their equipment which, while in some respects satisfactory, placed their scope of usefulness within very narrow limits. A parallel application is the use of Monel metal for the construction of food handling equipment. Heretofore the metals generally employed have been unsatisfactory due largely to their lack of resistance to attack by the natural acids contained in many of our food stuffs, such as those existing in dairy and general animal products. Undoubtedly here, nickel and the high grade copper-nickel alloys will prove a blessing to the community at large.

The possibilities in steam power development have been

advanced considerably by the introduction of Monel metal in such equipment, where heretofore nothing was available to meet the characteristic erosive action of superheated steam. By its use higher temperatures are being employed, and opportunities are afforded the modern engineer which he has long sought.

In the steel industry the need of economical material for the construction of equipment required in the acid pickling of steel products has long been felt. Here Monel metal is being employed today almost universally. Similarly in the chemical industry malleable nickel products have been introduced where heretofore materials of this character have been woefully lacking. By their use otherwise prohibitive operations in some instances have been converted into real commercial possibilities.

A very handsome and growing business has been built up in the use of both pure nickel and Monel metal for the fabrication of kitchen and general cafeteria equipment, replacing to some extent the older and less desirable nickel silvers and tinned copper. Hospital and general surgical apparatus constructed of Monel metal is more satisfactory to our health guardians than anything previously employed and the use of pure nickel projected for domestic cooking utensils will, it is expected, meet with great favor.

In the coal mining industry Monel metal has been established for the screening of the finer sizes of anthracite, for pump rods, and other parts commonly in contact with the average corrosive mine waters. In the glass industry for the construction of modern automatic equipment which of necessity must be heat resisting, nickel and some of its alloys have proven almost indispensable. Similarly the extended use of the metal together with chromium for the production of electric heating units stands without a parallel.

Radio fans should find interest in the fact that pure nickel strip is universally used in the plate construction of the modern vacuum tube. An alloy of nickel and iron termed "Platinite" is used as a substitute for platinum as leading-in wires of tungsten lamps on account of its expansion being identical with that of glass.

The addition of nickel in cast iron has been effected for special purposes and the subject is at present obtaining the consideration of a number of progressive foundry organizations.

The general permanency of the modern skyscraper is creating a demand for plumbing fixtures that will endure, and which is reflected in the growing practice of casting such fixtures in white metals, all of which are composed partly of nickel.

The ever growing practice of coating inferior metals with nickel is self-evident and calls only for comment on the modern method of accomplishing the operations, which have been developed by the trade and which are contributing so much to the increased application of nickel in this manner.

For strictly chemical purposes the use of nickel as a catalyst is growing and the possibilities of certain nickel compounds as demonstrated in the classic Edison storage battery is daily being more appreciated.

Even in the arts nickel is finding a quite definite place as incorporated together with zinc and gold in forming the now popular and handsome white gold and it is to be hoped that our public officers will soon recognize the wisdom of preparing our secondary coinage of pure nickel following the practice of many other nations.

Obviously nickel is fast coming into its own and undoubtedly the time is not far distant when it will more generally be recognized that nickel is exerting a dominating influence in the betterment of commercial metals.

Other metals will be taken up in our next issue.—Ed.

Molding Machine Practice

How the Molding Machine Is Put to Work in the Brass Foundry

Written for The Metal Industry by NELSON F. FLANAGAN, Foundryman

The small plain jolting machine which jolts and draws patterns is one of the simplest types made. The molds are butted by hand with either rammers or shovel. In a specialty shop in Detroit, where they make nothing but aluminum lasts for rubbers, rubber-boots and overshoes, they use this style machine. They turn out from 150 to 200 molds per day. The jolting machine mentioned above is a Pridmore, and is equipped for two last patterns in a flask. They are cored with a green sand core and a steel chill, and have a brass insert in them. The core is made on an arbor, and all arbors are made so that they fit flasks alike. They are so nearly perfect that I think there is hardly any variation. This of course makes a very substantial saving of metal, as all of the aluminum castings are of the same thickness and about the same weight. Without this device there would always be more or less of a variation in the thickness, which would cause a considerable loss in a year's time, as the lasts are sold by the pair instead of by the pound.

MAKING THE CORES

It might be interesting right here to give a brief description of the way the cores are made. First, a sort of a jig is made with adjusting devices, so that when the core-box is clamped and fastened in the jig and the arbor placed, the adjusting screw places the arbor in the exact center of the core-box. Then the arbors are fastened to a frame with guides so that when the frame is on the drag, the core is properly placed in the exact center of the casting, thereby producing a casting with uniform thickness of metal. When the device (which is patented) is set up and properly adjusted it does not need any more attention until a different size last core is required. One core-maker uses two of these devices. The core mixture is dry, sharp sand, preferably sea sand or lake sand mixed with plaster of Paris and wet with plain water; about one part plaster to ten of sand. A little experience will tell the amount of plaster needed. The sand should only be wet enough to ram in the core-box without crumbling. After the core is made and core-box is removed by drawing each half way from the core, the core-maker proceeds to make another core on the other jig, leaving the first core hanging on the arbor to set and dry. By the time the second core is finished the first core is ready to be set in the drag without any further drying. The core-maker then proceeds to make the next core.

Just before pouring the chills are placed, copies put on, weighed and poured. A pyrometer is used and metal poured from 1300 to 1350 F. The core-boxes are made in the foundry from start to finish. Instead of reversing with wax or clay, it is done with rubber. A plaster cast is taken from one half of the last pattern for the right foot. Another plaster cast is taken from the other half of the same pattern. After the plaster cast is set, it is removed and finished. The pattern is cleaned and reshellacked. Allowing for all shrinkages, rubber of the desired thickness is tacked to the inside of plaster cast and made as smooth as possible. You have to see it to believe what a smooth job can be done this way.

MAKING THE MOLD

Now the plaster cast with the rubber is ready for the sand. First a steel plate which is smooth and true in

every way is drilled and tapped, so that one half the pattern can be screwed to the plate. When the pattern is securely screwed on the plate a scratch is used to scratch an outline of the pattern on the steel plate, as a guide for setting the core in the proper place. Now molding sand is rammed into the rubber lined plaster cast, and struck off very even and smooth. The plate is placed on the core and the whole business rolled over. The core is shifted to its proper place after the plaster cast is lifted off. Then a side which has been rammed off the plate with the pattern screwed on is lowered onto the plate over the core, the pin holes or ears guiding the side into its proper place. The mold having been gated, etc., is ready for pouring. The half core on the plate is not secured in any way and does not shift. The metal for the core-box is 6 copper, 15 zinc and 79 aluminum. The plate and core act as the drag, and give a perfect casting free from blow-holes. The same process is gone through with the other half of the pattern, thus producing a two-part core-box. The two halves of the core-box are brushed with a wire brush. This is all the finishing the core-box requires, excepting the guides. The only opening the casting has is a half-inch hole. The core sand will run out of this opening quite freely with two or three taps from a hammer or vibrator.

FAST MOLDING

For a fast molding machine of the jolt squeeze and pattern drawing type, using split patterns, I like the Tabor and Nicholls machines. In a shop where I was they were equipped with Tabor machines using split patterns. We got out from 300 to 350 molds in 9 hours, from a molder and a helper, plenty of floor space and gravity spill troughs. This gravity spill trough is a greater help to the helper than to the molder, as pushing the molds over these rolls has a great deal to do with the shifts, which are so common in the foundry. We obtained better results by carrying the molds and setting them in place than by pushing them over these rolls. After the pouring gang pours it is a simple matter for the helper to dump or shake out the molds, as he can push the molds over the rolls towards the sand heap, saving a lot of heavy lugging. Each molder has two spill troughs long enough to hold about 40 molds each. The molder does nothing but mold. The helper dumps the 300 to 350 molds, wet and riddled sand, and helps the molder when he can by placing a flask on the machine and shaking parting on pattern. By this time the molder is back from the spill trough and goes right ahead with the next mold. A row of drags are made and while the molder is filling his second spill trough with drags a core setter is flouring and setting cores. So there is no delay when the molder is ready to cope the drags. There is a sprue head or button attachment to the squeezer head of the machine, so that when a cope is squeezed the button print is made at the same time. Then all the molder has to do is push a tube or sprue cutter through and blow it clean with air. Then the cope is near ready to be lifted off the machine. Before it is taken off the machine, the rough edges are pressed smooth and blown clean. This system requires quite a lot of floor space and a large sand heap, but the results obtained are quite satisfactory to the company. Semi-skilled help is used in this plant on these machines, the skilled molders being used on the bench.

MOLDING BOARD SIZES

Right here I want to say that I think it a mistake to try to get along with one size molding boards even though the flasks are one size. I am referring to molding boards used on molding machines that have a V-shaped strip along the four edges of the board. This strip is supposed to peen the mold or press the sand harder around the edges of the mold, thus tending to prevent shut-offs, runs and fall outs. My point is that while the flasks are all one size the patterns are not. Some are wide, taking up nearly the whole width of the flask; others not so wide. Let us assume that some of the patterns are one inch or more from the edge of flask, and the V-strip presses the sand between the pattern and edge of flask. Now we get a pattern that comes to one-fourth inch of the edge of the flask, or even less, and we have only this one style board. The strip is bound to press the sand hard over the ends of the pattern, and very likely to cause blows, misruns, porosity and the rest of the things that happen with hard rammed molds.

The Nicholls jolt squeeze with stripping plate is another very fast molding machine. I have obtained 600 molds per day with three machines, one machine making the entire 600 drags and the other two making copes. The gate in cope was stripped but there was a certain amount of extra care taken with the copes that could not be

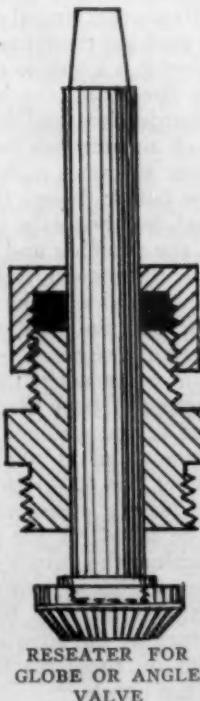
avoided in order to get castings free from sand holes; such as fingering or thumbing the sprue head, blowing the sprue clean and free from any loose sand that might have lodged there.

In order that the drags might be made much more quickly, the flasks were made so that the drop outs were the least trouble. Two shovels of sand in a flask, four or five jolts and a squeeze and the drags were all made, the patterns dropping or stripping by gravity as the operator reached over to lift the flask off the machine. No striking off the mold was necessary; no board was necessary. Simply jolt, squeeze and lift off the drag; then set it on the floor. Of course, this cannot be done on all classes of work, but it is practical on a good many. The metal was melted in a 60-inch Schwartz furnace and we took out 5,000 lbs. of metal a heat. I know this was overloading the furnace but we seemed to get along all right with it, at least, we never had any trouble through melting 5,000 lbs. in the furnace at one time, and getting three 5,000 lbs. heats per furnace per day. We had three of this style furnace, and melted nearly 2,000,000 lbs. of cufro-nickel in them, with only one extra set of lining. That is, we melted 2,000,000 lbs. using only two sets of linings. We also melted a small amount of pure nickel, Monel, 33% nickel silver, 18% nickel silver and 65-35 yellow brass in the same linings.

Seating Brass Globe Valves

Q.—What is a good type of machine to use for the seats of brass globe valves?

A.—For the seat of the body of the ordinary commercial hand seat valve from $\frac{1}{4}$ to 2 in. pipe, any standard make of Monitor lathe will do the work, the size of the valve, naturally requiring a machine sufficiently rigid for the size to be machined. The common practice is to seat the valve at the time the thread for the bonnet is either tapped or cut, so that all machined diameters will be concentric with the seat. If machine and tools are kept in good shape, and the operator is careful, an excellent job can be made in this manner, but many shops who lay claim to a better grade of product make a special operation of reseating their valves by means of a guided rose reamer. This guide screws in the threaded part, intended for the bonnet, and a rose reamer ground to the same angle as the seat (the stem of which is fitted closely to the bore of the guide) is revolved, usually at slow speed in a drill press which cuts the seat smooth, true and concentric with the bonnet thread. The guide is furnished with a stuffing box and is packed to eliminate possible chattering. After reseating, the machine is reversed, and the friction of the stem will unscrew the guide, the valve being held in the hand of the operator. If the machine has no reverse, a slight touch will loosen the guide and it can be unscrewed by rolling the hand in the reverse direction. This seating operation is almost imperative if the bonnet openings are machined upon a four or five spindle semi-automatic machine of this type.—W. F. HIRSCHMANN.



Grease for Gas Cock Keys

Q.—Please advise us as to a suitable grease for gas cock keys; something that will retain its lubricating qualities after the cock is nickel plated. At the present we are using rape seed oil and graphite, which in addition to being very dirty and hard to clean, breaks down in the potash bath previous to nickel plating.

A.—A suitable grease for gas cock keys to act as a lubricant is composed 50 per cent bees-wax, 50 per cent beef tallow. Melt on a slow fire and mix thoroughly. This lubricant has a solid body and allows the key or plug to turn smooth and solid. If you desire a grease with less body cut down on the bees-wax and add rape seed or lard oil. The best method to follow is to apply in a liquid form by heating and applying with a small brush which allows it to spread uniform.

Bees-wax and tallow are what most of the manufacturers are using. The cocks should be thoroughly cleaned after grinding and therefore should not have to remain long in the potash. It is the heat of the potash rather than the chemical itself that affects the cock greases. Melting point of cock grease is below that of boiling temperatures of potash solution.

The cocks should be opened to full extent before placing in the potash or plating solution. I have used ground mica in place of graphite with very good success.—P. W. B. and W. L. A.

Permanent-Mold Casting of Aluminum Alloys

A study of the state of the art in the production of aluminum castings by the permanent-mold process has been made by the Department of the Interior at the Pittsburgh experiment station of the Bureau of Mines. Experimental work undertaken some time ago on the gating of aluminum alloy pistons on casting in permanent molds has been completed. It has been shown that the occurrence of blow-holes and related defects can be controlled by proper gating and pouring practice.

Casting Metals

A Variety of Melting and Molding Troubles and Their Solutions
Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

CASTING WHITE METAL IN BRONZE MOLDS

Q.—I wish to cast a number of hard lead (or zinc-tin alloy) plates, about 4" x 5" and about $\frac{1}{8}$ " thick, with several words in raised letters, using a brass or bronze mold. The letters should be raised at least 1/16" or even $\frac{1}{8}$ ". What is the best way to make such a mold?

A.—Below is a sketch of a mold, which I would suggest to you to cast in aluminum bronze, although any good running bronze will do. The aluminum bronze consisting of 90% copper and 10% aluminum. If you have a large number of plates to make I would suggest that you make the mold like Fig. 1 if only a limited number I would suggest that you use Fig. 2. Smoke the face of the mold by placing it over a rosin smoke. A good cheap mixture consists of 90% lead and 10% antimony.



WILLIAM J. REARDON

CASTING BRONZE LINERS

Q.—We are having considerable trouble in casting bronze liners. These liners vary in diameter from 12" to 24" and from 18" to 36" in height. Kindly advise us the best method of casting these liners and a suitable alloy for same.

A.—The method I suggest is somewhat out of the ordinary brass foundry practice used for casting liners. It gives the best results that I know of outside of the centrifugal casting method. However, the sand method gives good results. The idea is to make the outside diameter in segment cores as marked on Fig. 3, as high as convenient to handle, and build up the mold as marked on sketch No. 2 and 3. Ram the sand around the outside of core and place a

flask outside of the core with room enough to get 3 inches of sand, and pour with spindle gates as marked on No. 4, on sketch. No risers are necessary and a very good composition for this class of work consists of copper 85.25, tin 8, lead .75 and zinc 4. The parts of the sketches are marked No. 1, 2, 3, and 4.

CASTING BRONZE IN CARBON MOLDS

Q.—Please furnish us with any information that you may have at hand, regarding the chilling or hardening of bronze gear blanks in carbon molds or chills. These castings weigh 30 pounds each and measure 10 $\frac{1}{2}$ " in diameter with 2 $\frac{1}{4}$ " face and 1 $\frac{1}{4}$ " wall.

A.—Carbon has the same effect of chilling bronze as pouring bronze into an iron mold has, without causing any of the ill effects so often found in pouring bronze in iron or steel molds. Unless you are an expert in this line many failures may be expected. The carbon mold has been used

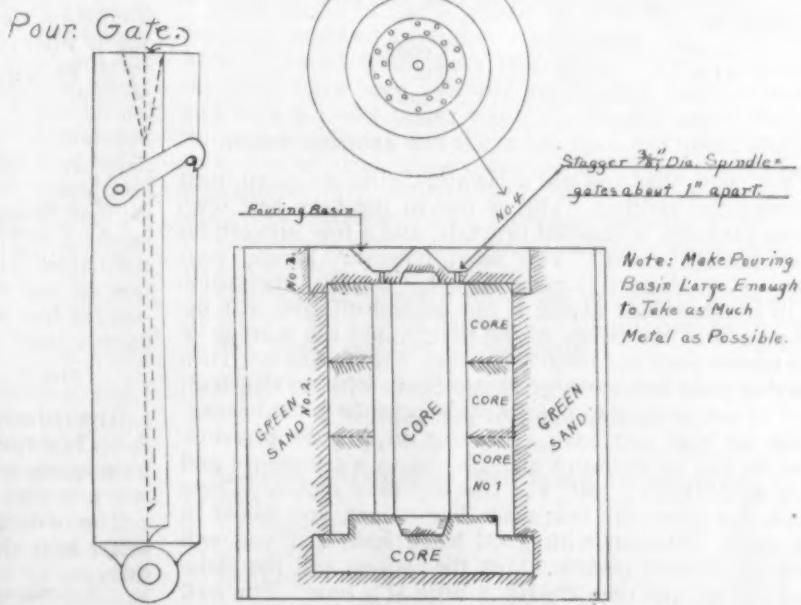
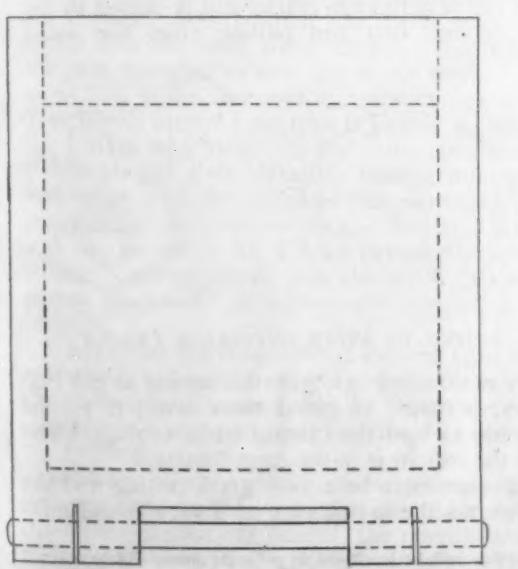
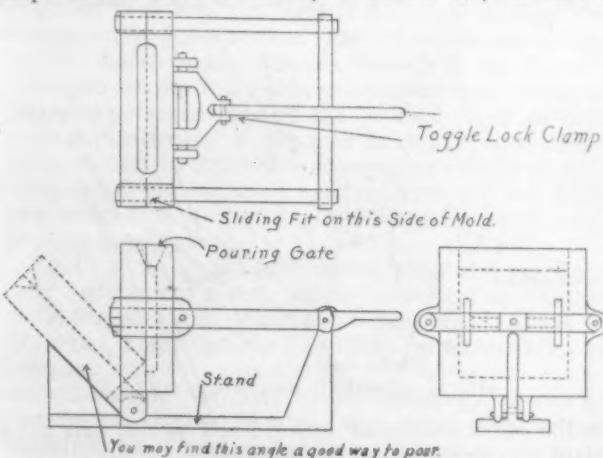


FIG. 3. MOLD FOR BRONZE LINES

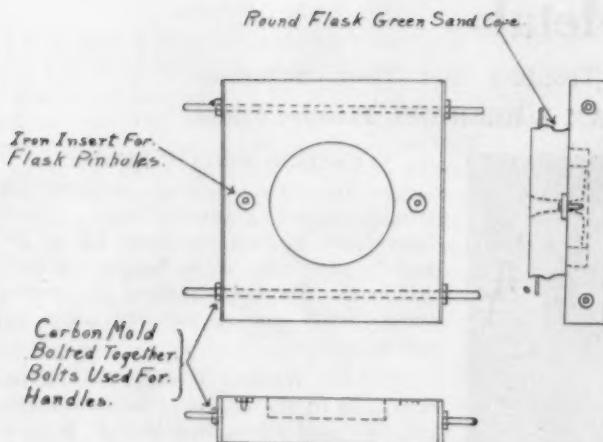


FIG. 4. CAREON MOLD FOR BRONZE GEAR BLANKS

very successfully for casting high tin gear blanks. All that is necessary is to secure two pieces of carbon 15" long, 7½" wide and 4" thick for your size casting. Place these two pieces of carbon together and drill a $\frac{5}{8}$ " hole through the carbon and bind the mold with $\frac{1}{4}$ " iron by placing the iron on the side and running a rod through the mold to hold the two sections of carbon. Then turn the carbon mold out to the dimensions required and use a sand cope. These molds will last a long time. The carbon will cause the metal to chill quickly and thereby cause a fine close grain without segregation. The carbon can be bought from any of the carbon manufacturing companies.

BRONZE GEARS

Q.—We would like to get the best formula to your knowledge for a bronze alloy for gears. Also directions for alloying and the proper pouring temperature.

At present we are using: Copper, 82%; Tin, 11%; Phosphor Copper, 2%; Yellow Brass Clips, 5%.

We use a Hawley-Schwartz down draft furnace. We melt the copper first then add tin and yellow clips, then phosphor copper just before pouring, or, in small heats we place the phosphor copper in bottom of the ladle and pour furnace contents upon it. What is your opinion of this formula and method and what pouring temperature would you advise?

A.—The best formula for bronze gears, one that is used very extensively, is known as English gear bronze and consists of:

86.00	.....	Copper.
11.25	.....	Tin.
.25	.....	Lead.
.50	.....	Zinc.
2.00	.....	15% phosphor copper.

You state that you use a Hawley-Schwartz down draft furnace for melting. This is one of the very best open flame furnaces, if handled properly, and a few suggestions may not go amiss. You may, however, handle your furnace satisfactorily; many do not. The first suggestion is to see that your tuyere is not burned off, and that the oil pipe is in the center of the tuyere, and the opening in the tuyere point not over $1\frac{1}{4}$ inches, like in sketch. Then see that your furnace is good and clean, with no slag built up. If you make slag your melting practice is not correct. Next see that you have a positive oil and air pressure. Use 40 lbs. oil pressure and 20 ounces air pressure and pour at 2,000 to 2,150° F. Use dry sand molds. These molds for gears are best made like a core, and baked in the oven. Blacken with good black lead, and you will have the desired results. Melt the copper, add the phosphor copper and then the tin, a little at a time. Stir well

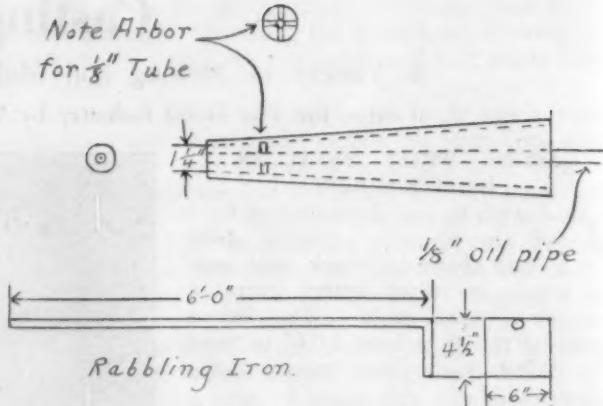


FIG. 5. OIL BURNER

with iron rabbling iron. We suggest that you use a small handful of salt before rabbling the metal.

CRACKED BRASS CASTINGS

Q.—We have experienced considerable trouble with brass castings cracking. Can you inform us what causes this. Metal is bought in ingot form, mixture—87.12 Copper; 5.45 Tin; 1.98 Lead; 5.45 Zinc, for 100 lb. heat and melted in No. 50 Crucible. Atomized coal is used for fuel, Cores are painted with plumbago. The castings we secure are gas tight but a very large percent crack in the bridge

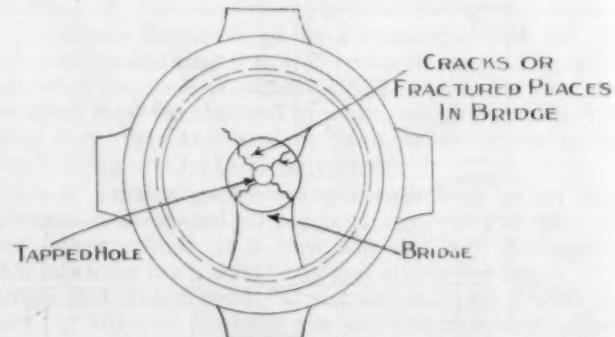


FIG. 6. CRACKED BRASS CASTING

from the $3\frac{1}{2}$ " x 24 thread outward and as this part has a constant pressure it makes them useless.

A.—We have received the sample casting and after examination we are of the opinion that the trouble of cracking is what is called shrinkage cracks and is caused by the light section cooling first and pulling from the heavy section.

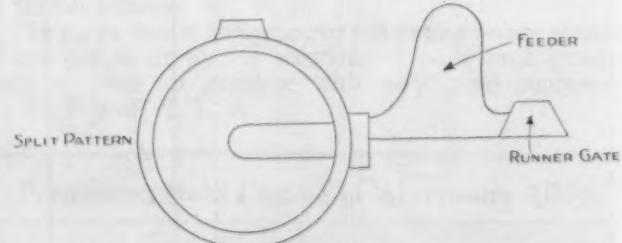


FIG. 7. GATING TO AVOID SHRINKAGE CRACKS

The remedy in this case is to gate the casting as per Fig. 7. They may, perhaps, be gated there now; if so, the gate is not made to feed the casting when cooling. You will note that the runner is in the cope.

The casting appears to be a very good casting and the metal in it also has the appearance of a very sound mixture.

This article will be continued in an early issue.—Ed.

The Answer to Most Rolling Mill Riddles

How Brass Rolling Mill Snags Appear and the Best Way to Get Around Them

Written for The Metal Industry by WILLIAM J. PETTIS, Rolling Mill Man

I receive many letters from men in the brass industry, asking help in overcoming some troubles or defects that appear in their products, or else in the finished product which their department is responsible for, the defect being being traced back to them. I answer to the best of my ability and with the full knowledge that the man seeking the information knows what is causing the trouble and the real remedy far better than I, first, because he is on the spot and can study this particular defect from all angles; second, he has a fund of accumulated experience to draw on or he would not be in charge of the department. But he will not, or else refuses, to recognize that the one remedy is an intensified application of the knowledge that is his to that particular part of the manufacturing process that is in his charge, not occasionally but hourly and daily and weekly; seeing to every detail of the process that a century of brass-making experience and tradition have shown to be necessary, which he knows, due to his own work on the way up to an executive position. This means the daily personal inspection of every homely, unromantic, little detail of the process. But this he leaves to "George," and reserves himself for some brilliant stroke, that generally doesn't come. Or he reaches out in hope of finding some magic formula that will do it, and as "George" has the same idea in a smaller way, perhaps, the little neglects pile up and the product is of an inferior quality. To correct it, the man in charge must diligently apply himself to the whole process until doing it right in every detail, has become a habit with himself and with the men under him, for one neglected item in the process will produce some defect.

To illustrate, in the tube casting shop of a certain company (which had a very successful history in this line of work, they suddenly found themselves unable to get sound castings. Their castings had badly pitted surfaces, blow-holes through the cross-section, and the rejects made it a serious matter. After the usual "groping," it was found that the introduction of a new spraying system for cooling the molds was primarily to blame. The man whose duty it was to clean and dress the molds, when this operation was completed would place his oil bucket and swabs in a certain place—out of the way—and they would remain there until the "round" was poured, the metal removed from the molds and the mold water cooled. Right here is where the new spraying system got in its work. A fine almost atomizing spray shot out at right angles and terminated over the oil bucket. As man is largely a creature of habit, the bucket was placed in the same spot each round and the molds got their dressing from a mixture of lard oil and water with the resultant bad castings. The foreman had relaxed in attention to the details. His department had run smoothly for a long period of time and he was letting "George" do it, with the result that it cost his employer thousands of dollars and himself a hard earned prestige.

I have just purchased some electric light fixtures and I note the brass ceiling canopy and the dome cap have what the trade terms "orange skin." This is the result of over-annealing; a common fault which spoils the appearance of the finished article.

With the modern muffle, under pyrometric control, this defect should be the least common. In many mills where the muffle capacity is limited, the operators are compelled to force the work, and it is difficult to avoid this condition.

The element of economy must necessarily play an important part, and often a compromise on quality is necessary to put production on a profitable basis. This is a very bad practice and starts a long train of evils. It opens up a line of least resistance that most of us are prone to follow. But assuming that there is adequate muffled capacity, properly equipped (as is generally the case to-day) the over-annealing of metal should cease to be a problem.

Of all the complaints, (and the list is a long one which the brass manufacturer receives) there is scarcely one that can be traced to a lack of knowledge of what should be done to prevent the evil, but most of them can easily be traced to the fact that it isn't done.

In the December issue of THE METAL INDUSTRY there appears an article by E. A. Bolton "Red Stains on Sheet Brass." This is properly a laboratory problem, but the thoroughness of the process of elimination, applied by the investigators to this trouble, should be a model for every brass man in finding the solution of his troubles that are born of faulty operation.

The one thing that threatens the successful finishing of any quantity of brass from the time it is cast up to the shipping room and in the packing case, is neglect—a relaxing of vigilance somewhere that has allowed the slurring over of some of the many details of operation that are necessary to the production of the finished article. I make this statement because there has been worked out a practice, drawn from long years of experience, that if faithfully carried out, will leave nothing but blank leaves in the complaint book.

Inhomogeneities in Alloys

In a study of inhomogeneities in non-ferrous alloys, being made by the Department of the Interior at the Ithaca, N. Y. office of the Bureau of Mines, a series of brasses varying only in the amount of lead present, and one of pure copper with varying amounts of copper oxide have been obtained for experimental work.

Each series is to be tested in both the hard-drawn and the annealed condition. Endurance test bars have been prepared from these two series. Two endurance machines have been specially constructed for this work, and tests are now under way. As the subject of the endurance of non-ferrous alloys has been much less studied than that of steel, these experiments should add to general information of that subject as well as to the special subject of inhomogeneities, especially since the alloys were chosen to supplement and not to duplicate work in progress at the University of Illinois.

The work at Ithaca is under the immediate supervision of Dr. H. W. Gillett, chief alloy chemist, assisted by Dr. E. W. Mack, assistant alloy chemist.

Solder for Nickel Silver

A good, inexpensive solder for nickel silver is as follows:

Copper	47
Nickel	11
Zinc	42
—P. W. BLAIR.	

Tripoli

Its Properties, Occurrence, History, Preparation and Uses

Written for The Metal Industry By P. B. BUTLER and G. V. B. LEVINGS, American Tripoli Company

Tripoli is a rather unusual form of silica, which so far, has been found in commercially valuable quantities only in the neighborhood of Seneca, Missouri, although there are numerous deposits of somewhat similar materials in several southern states. These have not, however, attained any position of real importance, due undoubtedly to definite structural limitations which have rendered them less suitable for the particular uses which have given Tripoli its principal outlets.

In "The Mining and Preparation of Tripoli" by Raymond B. Ladoo, Mineral Technologist, Serial No. 2190, Reports of Investigations, Bureau of Mines, Department of Interior, November, 1920, it is stated: "Since that time (1880-90) the term Tripoli has with increasing definiteness been reserved for the Seneca material, and other siliceous materials of similar origin and physical properties."

Tripoli is a soft, friable, porous, double refracting form of silica of the chalcedony variety. The average particle is less than .01 mm. in diameter, porous and has a fibrous structure. Its analysis is about 98 per cent silica as an

most bulky, as well as the most porous and absorbent form of natural silica on the market, so far as we know.

It also exhibits the characteristic silica adsorption but due to the much greater surface area this adsorption is correspondingly more active in Tripoli than with the other natural silicas.

HISTORY

The Seneca deposits were discovered in 1869, two years after the location of the town and two years prior to the arrival of the railroad (Atlantic & Pacific, now the St. Louis-San Francisco), on land now belonging to the American Tripoli Company. At that time the extent of the deposit was thought not to exceed eighty acres.

The deposits were first worked in 1872, when Husband Brothers, of St. Louis, built a small water power mill equipped with a circular saw set with "black diamonds" for sawing the crude stone into bricks, which were sold as "American Bath Brick" largely in and around St. Louis. This venture was not successful and was aban-



AMERICAN TRIPOLI COMPANY. QUARRY NO. 4 IN OKLAHOMA. OVERBURDEN 11 FEET THICK. TRIPOLI 11 FEET THICK

average, the balance being largely "ignition loss" and fractional percentages of alumina, iron and the alkalies.

For some time it was considered an altered form of chert or siliceous limestone, but recent investigations seem to indicate that neither conclusion is correct and that it is possibly a form of Novaculite marking the northern limits of the extensive Arkansas Novaculite formation. The fact that Novaculite is not known to occur outside the United States, except in a locality in the Tyrol, Austria, and that Tripoli is not found elsewhere would seem to justify the conclusion; also no Tripoli is known beyond three or four miles north of Seneca and as the deposits are followed south toward and into Arkansas they become noticeably harder and the resemblance to porous Novaculite increases.

Its specific gravity has been variously reported at from 2.15 to 2.41; the porosity of the crude stone is 45% and that of the powdered material, from 63% to 68%. The crude stone has an absorption of 38%, the powder having 52 to 53%. It is consequently the lightest weight and

doned after a few years, but an interest in Tripoli had been aroused and for some years the crude stone was shipped to St. Louis for grinding.

The material was first known as "cotton rock" and was also spoken of as "rotten stone." The first authentic record of the use of the word "Tripoli" is in 1885, but it was undoubtedly applied some years earlier.

From 1885 the history of the industry is essentially that of the American Tripoli Company, for, although numerous others have entered the field at one time and another they have never lasted long enough to have any appreciable effect on the industry. In that year, what is now the American Tripoli Company was started under the name of "Seneca Tripoli Works" by a Mr. Jackson and associates, who built the first grinding mill, having the old style heavy horizontal buhr mills used in grinding grain, its capacity is said to have been 40 barrels daily. In 1887 the name was changed to "Modoc Tripoli Mining and Manufacturing Company" and a second, and somewhat larger mill was built on the hill

close to the deposits about 1890. In 1892 the American Tripoli Company was incorporated.

For a number of years the production of powdered Tripoli was of little importance, in fact beginning with 1888 the production of water filters was more important and developed much more rapidly. This condition continued until about 1910, when the demand for the powdered Tripoli began to develop on a large scale. For a number of years this was known as "flour," possibly because flour-mill machinery was used.

The first uses for the powder seem to have been as a



BUCYRUS STEAM SHOVEL STRIPPING ON QUARRY
NO. 2. IT HANDLES 600 CUBIC YARDS DAILY.

scouring and cleaning powder and in polishing preparations. The first real impetus was given by the exhibit at the Chicago World's Fair in 1893; shortly after this its possibilities as an abrasive in buffering compositions were investigated with most satisfactory results and from then on the demand increased steadily until in 1900 the production was 2,600 tons.

The most important development of all, however, was the discovery in 1905 that Tripoli when properly treated made a very superior foundry parting. This immediately resulted in widespread interest, and as manufacturer after manufacturer took up the production of Tripoli Parting, the demand developed until in 1920 the production was 1,000 tons monthly, about 60% of which went into parting and 30% into the Tripoli buffering compositions in this country and Europe. In the meantime, other uses had also been developing as for instance as a filler in rubber compositions, as an abrasive in scouring soaps

buffing compositions, as nothing as efficient seems to have been found in Europe.

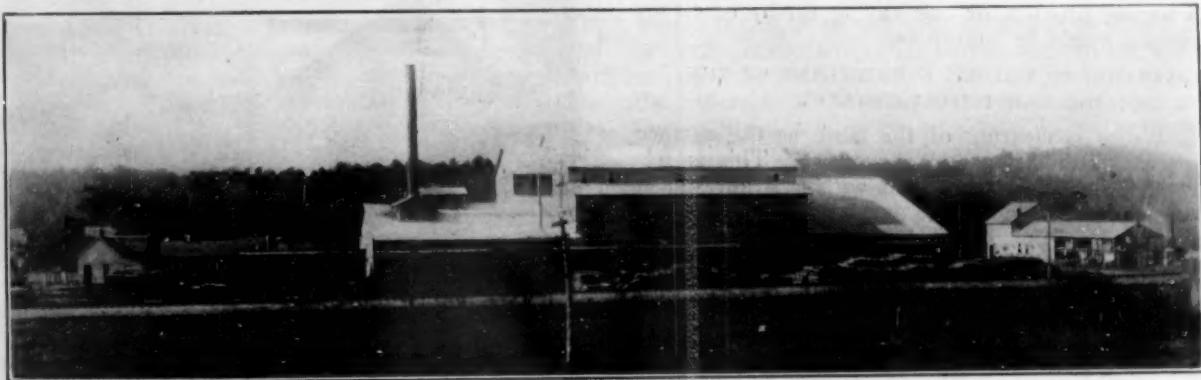
OCCURRENCE AND FORMATION

The principal deposits are found in the vicinity of Seneca, on the western edge of Newton County, Missouri, and across the line in Ottawa County, Oklahoma. It occurs in horizontal beds varying in thickness up to twelve feet, along the crests of the ridges. These deposits have not been subjected to any appreciable faulting, folding or crushing, and the minute size of the particle is consequently not due to any crushing resulting from earth movements. The deposits are covered with soil and other rock formations, the maximum overburden on the commercial deposits being about twelve feet.

In some places at some distance from Seneca it lies much deeper, and the deposits are frequently thicker; but there seems to be some definite relation between the quality of the deposits and their thickness and depth below the surface. So far, the deeper deposits have invariably been harder and frequently of the kind which hardens on being exposed to the air, and are of no commercial value in consequence.

There are several varieties of Tripoli in southwestern Missouri, northeastern Oklahoma and northern Arkansas which vary in texture from an extremely hard stone very similar to Novaculite, to some which are so exceedingly friable that in grinding they go at once into an impalpable powder, too fine to be of any marketable consequence. The hard Tripoli areas are very extensive, but the very soft variety is limited generally to pockets in the present producing deposits. For some unexplained reason Seneca seems to have the monopoly of the variety having a commercial value, in spite of the fact that since its discovery in 1869 the entire country has been very thoroughly gone over in the hopes of finding other similar deposits. To the south and east the Tripoli gets harder and usually deeper; to the west it becomes more mixed with chert and is generally harder; no deposits are found more than three or four miles north of Seneca.

It is of sedimentary origin and its formation is very probably identical with, or at least closely related to that of the upper Novaculite in Arkansas, which is supposed to have been composed of silica and salts of sodium and potassium, from which these soluble materials have been removed by percolating surface waters, leaving behind



GRINDING PLANT, FILTER STONE MILL, AMERICAN TRIPOLI COMPANY, SENECA, MO.

and powders, and as a mild mechanical cleanser in washing powders for fabrics.

The export business to England and Europe started shortly after the Chicago Exposition, and with the exception of the war period, it has shown constant development until it now amounts to about 15% of the production. Its use abroad is confined almost entirely to Tripoli

the closely interlocking silica particles like a silica skeleton which give the stone its high porosity.

From the structure and character of the particles it is believed that the silica was originally deposited as a colloid and very possibly as a gel. It has been quite definitely identified as a form of chalcedony which, it is known, is not formed under pressure; if there is pres-

sure a harder form of silica results. So it is believed that aside from a natural hardening there has been little change from its original form.

Because of its friability, outcrops of Tripoli are seldom found, for while it has great resistance to weather conditions once it is out of the ground, it does not seem to resist disintegration along the edges of the deposits on the hillsides; this observation does not, of course, apply to the harder, non-commercial varieties.

Interbedded strata and nodules of imbedded chert are very commonly associated with the deposits and affect their value; the best deposits are practically chert free, while others in some localities are so cherty as to be valueless. This intimate association with chert is undoubtedly responsible for the idea that Tripoli is an altered form of chert, but examination with the microscope using polarized light shows the particles to be so unlike that this theory of alteration is now practically abandoned. Some now incline to the theory that the Tripoli was deposited as a colloidal gel and the chert as colloidal or very finely divided crystalline silica.

The Seneca deposits are very extensive and of very uniform quality, both as regards chemical analysis and physical characteristics. They are not uniform as regards color except in rare instances, being mixed rose, cream and white which grade one into another. These, especially the rose, are generally the results of staining by the percolating surface waters carrying a little iron in solution. The rose color is generally confined to the edges of the deposits and such portions as may be more cracked and fissured, permitting penetration of the surface waters.

The character of the soil has a marked influence on the color as is to be expected. The color, however, has very little effect on the analysis, and so far as the other characteristics are concerned they are the same, regardless of the color.

IMPURITIES

As is the case with most deposits of sedimentary origin, there are some variations in the chemical analysis, but these have never been sufficient to effect its usefulness. The rose color is due, as has been stated, to an increase in the iron content, which has not been found to exceed 1.5%. These variations cannot be considered as impurities. Chert is an impurity, for it is a hard silica, and any included soil, clay or foreign matter is an impurity. In fact impurities are more physical in character than chemical, and the presence of anything resulting in a harder product, or one having earthy or clayey characteristics would be impurities.

PREPARATION OF TRIPOLI IN THE PLANT OF THE AMERICAN TRIPOLI COMPANY

The first step is clearing of the land, as the surface seldom permits cultivation and is wooded. This is followed by stripping the overburden with a steam shovel having caterpillar traction. The overburden on the commercially valuable deposits does not exceed twelve feet in thickness. The surface of the exposed Tripoli is then carefully cleaned before quarrying, to prevent any contamination by the soil or clay. The Tripoli is then quarried in the usual manner by the usual quarrying methods.

In the case of the stone suitable for filters, dynamite and black powder are not used, as these cause excessive shattering. Holes about two inches in diameter and placed about two feet apart are drilled to the bottom of the deposit along a line from two to three feet back of the face. These holes are loaded with unslacked lime and well tamped; the natural moisture in the Tripoli is sufficient to cause the lime to swell and loosen the mass along the line of holes; this method gives the minimum amount of fracturing.

Due to its porosity a factor of 30 cubic feet per ton is used to estimate the amount of stone in place in the quarry. After breaking, a factor of 45 cubic feet per ton is used. It is consequently evident that its volume is comparatively large.

This same porosity results in the stone as quarried containing from 30 to 38% moisture, and as this is too much for economical artificial drying, it is stored in large drying sheds having a total reserve capacity of about 7,000 tons, where it is left for from three to four months and the moisture reduced from 5% to 10%, according to weather conditions. It is then hauled by trucks to the mill, a distance of one and a half miles, located on the railroad.

MILLING

The trucks dump into a large skip which elevates the stone to the crude stone bins having a capacity of about 150 tons; the stone then passes through a large gyratory crusher where it is broken to about 2 in. maximum size; it is then elevated to the dryer feed bin, having a capacity of 50 tons, from which it is fed automatically into the revolving dryer, a 7 ft. x 50 ft. Ruggles-Coles return tube type which works at about two and a half r. p. m.

It takes the stone about 40 to 50 minutes to pass through the dryer, it then drops direct into a hammer mill, where it gets its first fine grinding, and is then elevated and passed over a 6' x 8' Newaygo screen, where the first product is taken out.

The oversize goes to a 6' x 16' pebble mill, loaded with French flint pebbles, where the final grinding is done. The product is elevated and passed over four Hummer vibrating screens, the product is sacked and the oversize returned to the pebble mill.

From the sackers the product, packed in 200-pound burlap bags with paper liners, goes direct to the cars or to the warehouse which has a capacity of 800 tons. The minimum car load is 30 tons, but the actual loadings average 35 tons; this depends entirely on the size of car furnished by the railroad. About 98% of the business is in car lots.

Three standard colors are produced: Rose, cream and white, and due to the mixed colors in the quarries hand sorting is unavoidable both in the quarries and on the drying sheds, although there is a growing demand for



ONE OF THE 24 DRYING SHEDS. ANNUAL CAPACITY 6000 TO 7000 TONS

"mill run" material in which no attention is given to color. It is naturally almost impossible to produce an absolutely standard color which will not show slight variations from time to time without such close hand sorting as would be entirely too expensive. However, such variations as occur are very seldom subject to objection; for parting a light color is, of course, preferred, while for Tripoli buffing compositions a rose is wanted in this country and a cream is preferred in England and Germany; there is no difference in the abrasive quality and the color is more generally associated in the mind of the actual

user with a certain quality of composition rather than with the quality of Tripoli used.

Three standard grades of fineness are recognized: "Once Ground," the coarsest, which is all through a 30-40 mesh screen and contains about 85% that is finer than 200 mesh; "Double Ground," the medium grade, all through 110 mesh, of which some 96% will pass a 200; and "Air Float," which is the air-floated dust, all of which is finer than 200 mesh and about 99.5% finer than 325.

It will be noticed that while the screens used are relatively coarse the bulk of the product in any grade is exceedingly fine; this is because the natural stone is very friable. In most grinding operations the problem is to produce a product sufficiently fine and a product passing a given screen will be satisfactory; in this business, however, the reverse is the case, the problem due to the friability of the stone is to keep the product from being too fine, and especially in Tripoli to be used in buffering compositions, there has to be a certain proportion between relatively coarse particles and the very fine.

There are a number of difficulties in connection with the grinding and handling of Tripoli, many of which have been traced to its adsorption of air and moisture at various temperatures; in many respects it does not act in grinding as other forms of silica do, and definite speeds and temperatures have had to be worked out in practice to produce the best results.

USES

At the present time the largest part of the production, about 60%, is used in the manufacture of foundry parting, for which it has been found peculiarly adapted, due to its physical characteristics of bulk, porosity, absorption and possibly its adsorption. The lighter colors are preferred for this purpose. Its porosity allows it to take up the fats, waxes and oils with which it is mixed and the particle is permeated with these instead of simply being coated as would be the case with a hard, non-absorbent material. Consequently it withstands deterioration very much better, in fact a properly prepared Tripoli parting should retain its useful qualities for at least a year. This has had a great deal to do with its rapid development, as large stocks can be carried. Possibly its high heat resisting quality has something to do with its suitability.

The second largest use is in the manufacture of Tripoli buffering compositions, which takes about 30% of the production, 4,000 to 5,000 tons annually in this country and abroad. The rose color is preferred in this country, but both rose and cream are equally used in England and Europe. The color is not of importance, except in so far as it is associated in the minds of the users of the compositions with a known quality of composition, as the abrasive qualities, porosity, absorption and bulk value are the same in any case, one color will be found equally satisfactory as another. It may not be amiss to mention here that a so-called "Tripoli Composition" may not necessarily contain any Tripoli, or possibly only a part of the abrasive employed will be Tripoli for various reasons. The phrase "Tripoli Composition" seems to be rather loosely used. The impression seems to be that the hard, non-absorbent materials are added more to give weight, to cut down the absorption of the more expensive stearic acid, tallow and other ingredients, and to thus produce a cheaper composition rather than as a means of producing a more satisfactory product.

Its high porosity and absorption make it possible for Tripoli to form a very strong bond with the stearic acid, tallow, paraffin, petrolatum, etc., with which it is mixed because the particles become well impregnated with these. The most important characteristic, however, is that brought out by Mr. C. L. Buchanan, in his article "Buff-

ing" in the June issue of *THE METAL INDUSTRY*, "that Tripoli must be sufficiently fine, and the stone from which it is crushed, of a degree of hardness that will permit the completion of crushing or abrasion to the end that the first cut is truly coarser than the succeeding ones." In other words, the true Tripoli particle continues to break down under relatively slight pressure until it becomes an impalpable powder, so fine that it will not settle either in air or water for a long period. This is undoubtedly due to its fibrous structure and its porosity, and explains why the harder varieties of silica are not satisfactory for this purpose.

Tripoli is also being used in increasing quantities in hard rubber compositions as a filler, its absorption making the characteristic close bond with the other ingredients without undue weight, and it is possible that its adsorption also plays an important part in some cases.

It is rapidly coming to the front as a mechanical cleanser for use with soap and other detergents in any cleaning operation, as the washing of clothes in commercial laundries, in household electric washing machines, as a scrubbing powder and scouring powder, and also in scouring soaps. Tripoli has a tendency to soften water, it adsorbs calcium salts as well as those of magnesium at ordinary temperatures, and if the water or the soap used is very slightly alkaline, less soap is required to form a lather with Tripoli than without it (43% less soap). It is now being used for these purposes, with some rather unexpected results. Spot and hand rubbing is largely avoided in the washing of clothes, the machine is kept clean, less time is required, and something of a saving is effected in the use of soap and soda. Tripoli also seems to have an affinity for many stains, possibly because of the extreme fineness of the majority of the particles. It has been found much superior to other and harsher materials in the cleaning of tile floors, woodwork, and kitchen appliances. It leaves the skin in fine condition, soft and pliable, and does not injure the finest fabrics. Much of its success as a cleaner is undoubtedly due to the fact that the minute particles are porous and take up the soap and then carry it with them into the most minute pores, crevices and meshes of the article to be cleaned, its mild abrasive action plus the soap does the work.

It is also found to be very satisfactory as a filler and carrier for the active ingredients in insecticide dusts; airplane experiments have proved very satisfactory and show no segregation or separation of the Tripoli and the poison used. It can be mixed with up to 5% moisture and dust perfectly immediately. It carries well in the air and yet settles sufficiently to give the required results, coating the underside of the foliage, as well as the upper side quite thoroughly. It is inert chemically, so far as these active insecticides are concerned, and, being purely a ground stone, having nothing of an earthy or clayey nature, such pellets as may be formed break up easily, in fact, these frequently disintegrate of themselves on drying unless the liquid used acts as a binder.

The cream Tripoli has fusion point of about 3,300 deg. F., the rose is about 75 deg. lower; either may be used in combination with other materials as a refractory cement which will stand up to 3,150 degrees F.

There are a number of other uses, which, while interesting, are still of minor importance.

The production of filter stones is still an important item, although it is decreasing with the gradual improvement of the water supply systems in the larger towns and cities. A considerable business is done with the Latin-American countries and other tropical and sub-tropical countries where the water conditions are still not all that could be desired. While Tripoli stone removes the silt and other suspended materials found in water, its princi-

pal advantage is that because of its minute pores it prevents the passage of many of the dangerous micro-organisms found in water and thus helps to prevent disease. Many bacteriological tests made during the past thirty years have invariably shown an efficiency of from 98% plus to 100% in the removal of these micro-organisms.

These filter stones are of three classes, known as "Siphon," "Gravity" and "Pressure": The first is a complete filter in itself, and is placed in a pail or other container with the water to be filtered, the water passes through the stone and syphons out through a rubber tube. The second is generally a Tripoli disc, although stones resembling the siphon type are also used; two containers are required, an upper one fitted with the filter stone contains the unfiltered water and a lower one in which the filtered water collects. The third is the style of stone used in the metal containers which are attached to the water system.

These stones, with proper care, last indefinitely and are very easily kept clean by rubbing with a stiff brush in water, which frees the surface of any accumulated silt or other material. They are not affected by repeated wetting and drying nor by freezing. They are very efficient in removing odors as the water passes through the filters. It is not claimed that the stone has any effect on

substances in solution in the water, in spite of its known adsorption of many of these, as the movement of water through them is too rapid to permit any appreciable adsorption.

In the preparation of filters choice blocks of stone are first sawed into square blocks of proper size, then dried and turned down to the proper size and style on large carborundum coated wheels; the cylinders used in pressure filters are bored with a special bit, and chambering is done on a suitable lathe.

TESTS FOR TRIPOLI

There are two preliminary tests in use: First it is tested between the teeth to determine the texture, any hard particles are quickly noticed, as well as any hardness unusual to Tripoli. If this test, which comes first because no equipment is needed, is satisfactory, it is then examined with a high power microscope using polarized light, a purple and green color screen and crossed nicols; this test identifies the Tripoli particle, as its double refraction (two-color combination) is distinctive; 430 diameters magnification is generally used. This test does not, of course, indicate texture or porosity. If the first two tests are satisfactory further examination to determine specific gravity, porosity and absorption is made.

Unusual Bronze Figure

At the recent Winter Exhibition of the National Academy of Design, in New York, one of the exhibits was a bronze entitled "Star Dust" by Alfred Lenz. As shown in the illustration the bronze shows two figures seemingly suspended in the sky. Mr. Lenz's methods and ideas are so unusual as to merit the following notice from the New York Commercial, December 6, 1923.

"Mr. Lenz's beautiful small bronze, "Star Dust," has attracted unusual attention from all visitors to the Acad-

models his design in wax, but carries it through all stages of its development, including the fusing of the metals and casting to the final adding of those delicate gradations of color that distinguish his bronzes from others.

"It is only within comparatively recent years that Mr. Lenz has sent his work to the Academy, but for years it has attracted the attention of connoisseurs and all interested in the charm and beauty of exquisitely modeled and fanciful figures in bronze."

Green Gold on Bag Frames

The frame should be plated in a high brass solution.

Water	1 gallon
Sodium Cyanide	6 ozs.
Copper Cyanide	4 ozs.
Zinc Cyanide	1 oz.
Bicarbonate of Soda	1 oz.
Sal Ammoniac	½ oz.

Use brass anodes made of 80% copper, 20% zinc. The solution should be used at 80° F. at 4 to 5 volts. Prepare the solution in the order given, using one-third of the water at 140° F. Add the sodium cyanide first, then the copper and zinc cyanide. When dissolved, add the balance of the water cold, then the bicarbonate of soda and sal ammoniac. Stir the solution thoroughly and it is ready for use when properly connected up. After brass plating the frames for a sufficient length of time to withstand a light scouring down with a soft cloth buff and pumice stone and water to produce the desired finish, immerse the articles as they come direct from the brass plating solution, after thoroughly washing in water in the following:

Water	1 gallon Temp. 180° F.
Caustic Soda	8 ozs.
Lead Acetate	4 ozs.
Liver of Sulphur or Polysulphide	¼ oz.

or sufficient to produce a smutty black on the brass plated articles inside of a few minutes. After the black is produced, wash and scour down as outlined. Lacquer afterwards with a brush type lacquer, either as a dip or spray. The results will be an imitation green gold finish that will resemble the real green gold finish.—C. H. PROCTOR.



BRONZE CASTING—"STAR DUST"

emy, and it is in keeping with his reputation already established by such charming things as 'Pavlova,' purchased several years ago by the Metropolitan Museum of Art.

"Mr. Lenz is several artists in one, for he not only

The Tarnishing and Detarnishing of Silver

Causes of Tarnishing and Comparison of Methods of Removal. Properties of Moss Silver*

By G. W. VINAL and G. N. SCHRAMM

ABSTRACT

The tarnishing of silver is caused by the formation of the sulphide film for which certain colors are characteristic, and indicate the extent of the tarnishing. The effect of hydrogen sulphide gas in producing tarnish is relatively small in the absence of moisture. The presence of small amounts of moisture or sulphur dioxide greatly accelerate its tarnishing action. The tarnishing is also accelerated by the presence of certain films, such as soap, which may be on the surface of the silver. Conditions for producing a standard and reproducible tarnish were found and the weight and thickness of the tarnish film determined. Sterling silver tarnishes more rapidly than pure silver.

1. INTRODUCTION

This investigation was undertaken in response to the request of the Office of Home Economics of the Department of Agriculture. The primary object of the work was to study the electrolytic method for detarnishing silver, but as a preliminary to the study of this process it was necessary first to investigate the properties of the tarnish film. The ordinary tarnishing of silver is caused by the formation of a sulphide film for which certain colors are characteristic and indicate the extent of the tarnish. The effect of hydrogen sulphide gas in producing tarnish on silver is relatively small in the absence of moisture, but the presence of small amounts of moisture or of sulphur dioxide greatly accelerate its tarnishing action. Tarnishing is also accelerated by the presence of certain films such as soap which may be on the surface of the silver. Satisfactory conditions for producing a standard and reproducible tarnish were found and the weight and thickness of the tarnish film determined. Sterling silver tarnishes somewhat more readily than pure silver.

2. THE TARNISHING OF SILVER

The tarnishing effect of various combinations of gases and solutions was studied to find a reproducible process for preparing standard tarnishes which could be used in the experiments on detarnishing. The preliminary experiments were made on spoons, including both sterling and plated ware, but these were not well adapted to the conditions of the laboratory experiments, and therefore the later experiments were made on silver rods and on strips of silver 10cm. long and 1½ cm. wide. Strips of pure silver and of sterling silver were used for each experiment.

(a) Experiments to establish a standard of tarnish. Tarnishing of silver in sulphide solutions.

An effort was made to produce a standard tarnish by immersing a silver rod in a sulphide solution for some particular length of time. A polished rod of pure silver was tarnished in a solution of sodium sulphide. The rod was immersed successively to greater depths for periods of 20 seconds. Between each immersion it was drawn out, rinsed, and dried. The rod was dipped eleven times. The first section was therefore in the tarnishing solution for 220 seconds and the last section for only 20 seconds, intermediate sections were immersed in proportion. The results of this experiment were a series of colored tarnishes ranging from yellow to greenish-blue.

The effect of drawing the rod out of the liquid into the air between each immersion was probably of greater im-

portance than the actual length of time the rod was immersed, although this was not realized at the time the experiment was made. The results of a subsequent experiment are seen in Fig. 1, showing a rod of polished silver, the left end of which was immersed in a solution of N/10



FIG. 1. SILVER ROD TARNISHED IN N/10 SODIUM SULPHIDE DURING 5 MINUTES IMMERSION

sodium sulphide for 5 minutes without producing any visible tarnish except for a ring at the surface of the solution at the point marked A. This suggested that the air was taking part in the reaction and accordingly the other end of the same rod was immersed in the same solution for a period of 5 minutes, but during this time the rod was drawn out of the solution into the air 100 times. A pronounced tarnish was produced. This suggested adding an oxidizing agent to the sulphide solution. It was found that when hydrogen peroxide was added to N/100 sodium sulphide the solution becomes yellow for a short period of time during which the tarnishing action on the silver is very severe. This yellow color gradually disappears and after it has vanished the solution has little if any tarnishing action. Fifteen seconds immersion in the N/100 solution of the sulphide with the hydrogen peroxide added produced a deep blue tarnish on the silver rod, in marked contrast to the result produced on the rod shown in Fig. 1, the left end of which was unaffected when immersed for 5 minutes in a solution 10 times as strong but without the hydrogen peroxide. It is necessary to add an excess of the hydrogen peroxide to produce this reaction as otherwise tarnishing will not occur.

Further dilution of the sulphide solution to N/500 with the peroxide added was still too strong a tarnishing agent. It was found that a solution N/1000 of sodium sulphide with H_2O_2 added produced reproducible tarnishes by sufficiently small steps. The completeness of the reaction makes it possible to obtain successive equal steps as shown on the large rod in Fig. 2. The succession of colors was as follows: Beginning with the untarnished end, yellow, red, purple, blue, blue-green, and gunmetal.



Untarnished Yellow Red Purple Blue Blue-Green Gun Metal

FIG. 2. COLOR SCALE OF TARNISHES

In other experiments where the steps of the successive tarnishes were smaller a distinct brown stage was recognized between the yellow and the red. Following the gunmetal stage which shows some metallic luster is a final sooty black without metallic luster. It was found possible to make the solutions of sodium sulphide produce tarnishes also by the addition of small amounts of the strong mineral acids.

Because of the transitory tarnishing effect of the solutions described above it was necessary to find a more permanent solution which could be used repeatedly. A satisfactory solution was prepared by dissolving flowers of sulphur in N/10 sodium sulphide and filtering off the clear solution. This solution which contains the so-called polysulphides, Na_2S_x , has a bright yellow color and a slight odor of hydrogen sulphide, and retains its activity un-

diminished over a period of several days. Fig. 3 shows specimens of sterling silver and pure silver tarnished under identical conditions in such a solution. It will be observed that the sterling silver is much more tarnished than the pure silver.

Tarnishing of specimens in various percentages of hydrogen sulphide and sulphur dioxide.—Systematic experiments were then begun to determine the cause of tarnishing under household conditions and to establish a standard and reproducible tarnish. The test specimens were strips about 10 cm. long by 1½ cm. wide, each having a hole in one end so that it could be hung on a glass hook in the tarnishing atmosphere. Each strip was stamped with a letter and number to identify it. So far as it was possible, a few specimens of metals other than silver were plated with silver and burnished for use in these experiments also.

The tarnishing chamber consisted of a large vacuum desiccator which could be evacuated by an oil pump, and into which measured amounts of hydrogen sulphide, sulphur dioxide, and air could be passed from a gas burette.

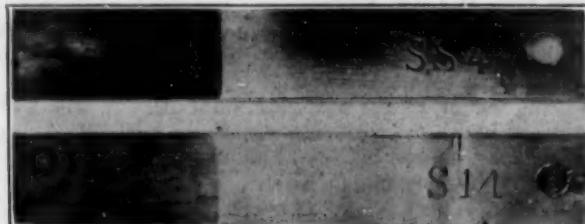


FIG. 3. SPECIMEN OF STERLING SILVER (UPPER) AND PURE SILVER (LOWER) TARNISHED UNDER IDENTICAL CONDITIONS IN A SOLUTION OF N/10 SODIUM SULPHIDE, TO WHICH SULPHUR HAS BEEN ADDED. THE STERLING SILVER IS MORE TARNISHED.

The arrangement of the apparatus is shown in Fig. 4.

In order to study the effect of the tarnishing gases in the presence as well as the absence of moisture, it was necessary to dry the hydrogen sulphide and sulphur dioxide and also to keep a drying agent in the bottom of the desiccator when the effect of the gas in the dry condition was to be determined. In the first experiment concentrated sulphuric acid was placed in the desiccator, but this was found to be unsatisfactory because of the reaction occurring between the hydrogen sulphide and sulphuric acid. After some experiments had been made it was found that calcium chloride was the most suitable drying agent, although there is a slight reaction between hydrogen sulphide and the calcium chloride. The hydrogen sulphide gas from the Kipp generator was dried by passing it through a U-tube containing granulated calcium chloride, and the sulphur dioxide was dried by passing it through a wash bottle containing concentrated sulphuric acid. The volume of the gases passed into the desiccator was measured by a gas burette.

The method of making the experiments was as follows: The desiccator was evacuated by an oil pump and the required percentage of H_2S and SO_2 passed in from the burette, after which air was drawn in through a purifying train consisting of concentrated solution of potassium hydroxide, a concentrated solution of potassium bichromate in sulphuric acid and a U-tube filled with glass wool until the pressure in the desiccator had again become normal. The percentages of hydrogen sulphide given are the percentages of gas delivered by the generator as measured by the burette. An analysis of the gas from this generator showed it to contain 90 per cent of hydrogen sulphide.

Experiments were made to determine the effect of the

gases singly and when mixed in varying proportions in the presence and absence of moisture. When the presence of water vapor was desired, the air entering the desiccator was bubbled through a wash bottle of water in place of the purifying train mentioned above. In Table 1 are given the results of experiments on the tarnishing of silver and other metals. This table includes only a portion of a large number of experiments which were made on this subject.

Since the tarnishing of silver is accompanied by a series of colors similar to those described in a preceding section, the colors afford the best means which we have by which to judge the extent of tarnishing. Our experiments show that these colors occur in regular order and can be repeated even when the tarnishing is done under quite diverse conditions. The accompanying Fig. 5 gives curves

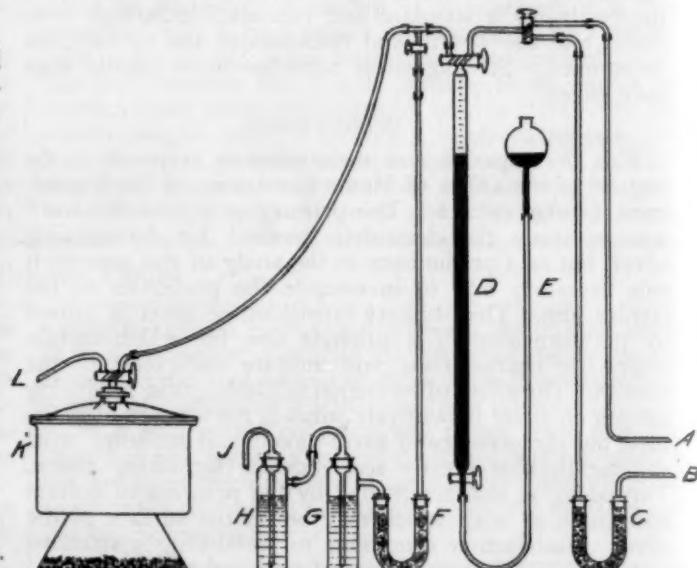


FIG. 4. TARNISHING CHAMBER AND GAS BURETTE

A— SO_2 inset; B— H_2S inset; C— CaO_2 tube; D—Gas burette; E—Leveling tube; F—Glass wool tube; G—Gas wash bottle containing KOH. H—Gas wash bottle containing H_2SO_4 and $K_2Cr_2O_7$; J—Air inlet; K—Vacuum desiccator; L—Vacuum connection.

which indicate the color produced during an exposure of pure silver two hours to gases of the percentage given by the horizontal ordinate. A similar diagram might be drawn also for sterling silver. In place of the vertical ordinate, a scale of colors is given. The gases, hydrogen sulphide and sulphur dioxide by themselves produced relatively little effect as shown in this figure. Combinations of these gases produced very pronounced effects. Figures are given for fixed percentages of each when combined with varying percentages of the other. This diagram shows clearly a great acceleration in the tarnishing when moisture is present. It seems probable that if the last trace of moisture could be excluded, hydrogen sulphide and sulphur dioxide by themselves would have no tarnishing effect even though present to the extent of 30 per cent. Although this diagram cannot be considered as a mathematical expression of the relation of two variable quantities, it is nevertheless interesting to measure the slopes of the various lines in order to obtain an idea of the relative magnitude of the tarnishing effects of the various gases.

In Table 2 are given the relative effects of dry and moist hydrogen sulphide and sulphur dioxide and combinations of these gases in varying proportions on sterling silver and pure silver.

Expressed in words, this table means that a minimum of two per cent hydrogen sulphide with a little sulphur dioxide is about as effective as 30 per cent hydrogen sulphide.

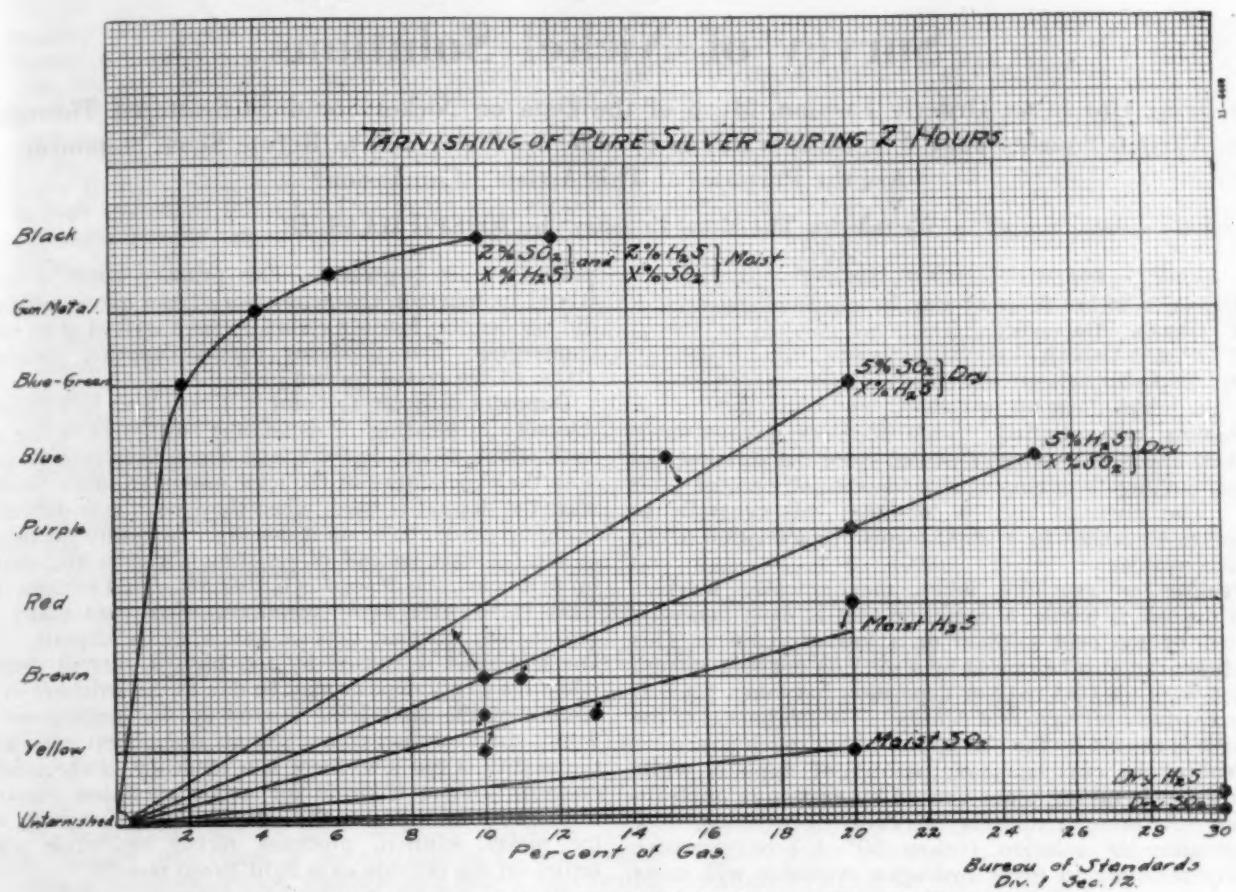


FIG. 5. COLOR PRODUCED DURING AN EXPOSURE OF PURE SILVER DURING 2 HOURS

TABLE 1

TARNISHING OF SILVER AND OTHER METALS IN HYDROGEN SULPHIDE, SULPHUR DIOXIDE, AND MIXTURES OF THE TWO DURING TWO HOURS' EXPOSURE

Specimen	30% H ₂ S dry	20% H ₂ S moist	20% SO ₂ moist	5% H ₂ S { dry 5% SO ₂ } moist	5% H ₂ S { moist 5% SO ₂ } dry
Pure silver....	None	Slight	Very faint yellow	Green, black on edge	Heavy dull black
Sterling silver.	Reddish-brown	Yellow	do	Gray to black	Heavy, gunmetal
Plated silver..	None	Slight	do	Green, black on edge	Heavy, dull black
Nickel silver ¹ .	Slight	Brown	Slight	Yellow, brown on edges	Heavy, almost black
Brass	Slight	Brown	Dull yellow	Reddish-yellow	Heavy, yellow to black
Copper	Bluish film	Heavy blue-black	Dull brown	Heavy dull black	.....
Tin	None	None	None	None	Opalescent in spots
Aluminum	None	None	None	None	None, "sweated"
Nickel	None	Slight, brown	Dull brown	Heavy reddish-blue	Heavy, brown to black
Zinc	None	None	Dull gray, sticky	None	Opalescent film
Iron .....	.....	.....	Gray to black (sticky)	Brown to black	

¹ Nickel silver is an alloy of zinc, copper and nickel.

dioxide and moisture present is many times more active in tarnishing silver than dry hydrogen sulphide, even when present to the extent of 30 per cent. Fig. 6 shows three strips of pure, sterling, and plated silver tarnished in a gas atmosphere of hydrogen sulphide and sulphur dioxide. The sterling silver has lost its metallic luster entirely. The other two are not as heavily tarnished.

TABLE 2
RELATIVE TARNISHING EFFECT OF DIFFERENT GASES

Tarnishing Gas	Sterling Silver (Diagram)	Pure Silver (Diagram)
Dry SO ₂	1	1
Moist SO ₂	3	10
Dry H ₂ S	13	3
Moist H ₂ S	23	26
5% H ₂ S, SO ₂ varying, dry..	48	40
5% SO ₂ , H ₂ S varying, dry..	91	60
2% H ₂ S, SO ₂ varying, moist.	500	500
1% SO ₂ , H ₂ S varying, moist.	500	500

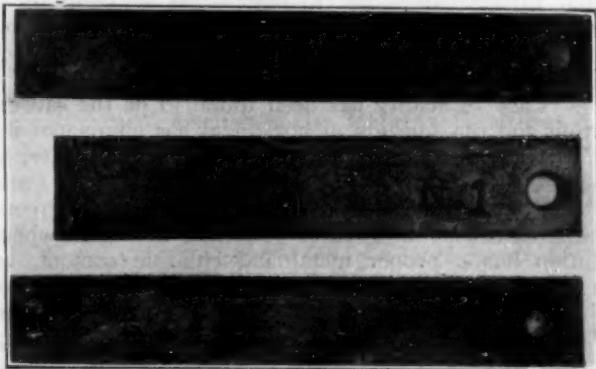


FIG. 6. SILVER STRIPS TARNISHED IN A GAS ATMOSPHERE. THE UPPER STRIP OF STERLING SILVER IS THE MOST TARNISHED AND HAS LOST ITS METALLIC LUSTRE. THE MIDDLE STRIP IS SILVER PLATED ON NICKEL, AND THE LOWER, PURE SILVER

Survey of Nickel Solutions

To Bring Out in an Orderly Fashion, Much of the Data on Nickel Solutions Scattered Throughout Various Sources That Will Be of Value to the Electro Plater and to Refute Some Statements Are the Purposes of This Article—Conclusion*

Written for The Metal Industry by JOSEPH HAAS, JR.

DEFECTIVE NICKEL DEPOSITS

Defective nickel deposits may be classified into:

1. Peeling Deposits.
2. Pitted Deposits.
3. Deposits difficult to color.

I shall take them up in order.

Peeling when buffed. Such deposits have a satisfactory appearance when removed from the solution, but when buffing is attempted, the deposit blisters or peals off. The cause of such a condition will generally be found to be caused by a slight tarnish or oxidation of the surface plated.

Peeling or cracking when mechanically worked. The deposit is brittle, a condition that is most generally caused by too acid solution or a low ph (3-4). This condition can also be caused by a solution not acid enough or too high ph (6.3 rp); or deposition has taken place at an excessively high current density. The brittleness of the deposit is caused by the absorption of hydrogen gas.

Peeling or curling (exfoliation) of deposit while deposition is taking place caused by excessive uncleanliness. Although this is a rare occurrence, low temperature of solution (below 50° F.) or excessive acidity resulting in great hydrogen evolution will cause this.

Pitted Deposits. The pitting of nickel deposits is the most annoying trouble that the plater has to contend with. By pitting is meant small holes in an otherwise perfect deposit, produced by hydrogen gas clinging to the cathode surface. These pits cannot be buffed out of the deposit, and present a very bad appearance. The plater thinking that he has overcome this difficulty, has often found this evil to return, and his previous remedy to be without effect upon its re-occurrence. Some of the probable causes of pitting may be summarized as follows:

1. For the nickel solution in use too high a current density is being used. To remedy, reduce the current density.
2. Agitation by air has often been known to cause pitting upon the lower surfaces. When cathode mechanical motion was substituted, the pitting ceased.
3. Improperly polished or too rough a polish on base metal giving ledges for hydrogen gas to cling to has caused pitting. The same solution with same current conditions has produced perfect deposits upon articles with a finer polished surface.
4. Lack of acidity has been found to be the cause of pitting and the addition of boric acid has eliminated it.

5. Excessive gassing, due to too great an acidity, has also been the cause of pitting. However, pitting caused by the above conditions are trivial, and easily overcome. The most exasperating cases of pitting are those when a solution has a proper metal and chlorine content, and shows the proper acidity, and yet pitting persists. Probably the nearest anyone has come to stating the nature of pits has been Madsen, who has stated, that although more hydrogen is generated in the deposition of nickel when the bath is more acid, this condition is not the primary cause of pits, but only exaggerates them, if the

primary cause is present. This primary cause he finally traced to inherent characteristics of the anode which he did not define. Madsen claims to have arrived at an anode composition that produces pitless deposits, dissolving 100% of the nickel content.

Deposits difficult to color. The plater has frequent difficulty in pleasing or satisfying buffers as to the ease with which nickel deposits lend themselves to high color with the expenditure of the least muscular effort. Buffers state the deposit is hard, when they mean it is difficult to bring up a high color on it quickly. In reality the deposit is soft, so that instead of resisting abrasion and coming up to a color, the deposit is buffed away and remains dull. This is so with two exceptions, which are easily determinable; a burnt deposit and a gritty deposit. The burnt deposit is caused by too high a current density, while the gritty deposit may be due to the sediment in the bottom of the tank being stirred up and settling on the work. In a solution containing no ammonium salts, when the acidity is too low, there is a tendency, if the solution contains sodium chloride for anode corrosion purposes, to form caustic soda at the cathode, which, reacting with the nickel solution, produces nickel hydroxide which settles on the cathode as a light green powder.

COPPER PLATING STEEL

The copper plating of ferrous articles before nickel plating to gain a better protection against corrosion, is a practice upon which there is a variety of opinion. Theoretically, it is held as wrong practice in that corrosion is really accelerated. Others again maintain that they have convinced themselves that copper plating before nickel plating has been a greater protection against corrosion. Both of these views can be reconciled. When copper is deposited upon steel and then transferred to the nickel solution, the deposit from the nickel solution is dull and relatively hard to buff, so that considerable nickel is removed. Such articles have been found to corrode much more rapidly than when the copper deposit is omitted. Investigation of the method of operations of those who claim that copper plating is a protection against corrosion reveals that after copper plating, the deposit was buffed before nickel plating so that after nickel plating the articles could be buffed with relative ease without removing much of the nickel deposit. It is also reasonable to assume that buffing the copper deposit increased its density and also is accountable for increase in protection against corrosion.

PREPARATION OF NICKEL SOLUTIONS

If consistent and uniform, results are to be expected from nickel solutions, the utmost care and cleanliness should be exercised in their preparation. Taking the chemicals and merely dumping them into the bottom of the tank and then stirring is a practice that is to be discouraged. There should be on hand two or three fifty gallon barrels or tanks for making up nickel solutions. The barrels should be filled with warm water and the weighed nickel salts suspended in linen bags and stirring continued until complete solution is obtained. The dissolved nickel salts should then be purified in a satisfactory

*Parts 1, 2, 3, 4, 5, and 6 were published in our issues for September, 1921; November, 1922; February, June, July, and December, 1923.

manner to neutralize acidity or remove any impurities as copper, zinc or iron, and allowed to settle. In the meantime, the tank in which the solution is to be made should be filled one-third full of water and have suspended in linen bags the other components of the solution. The purified nickel solution is then dipped into the tank, and when there is danger of stirring up the sediment, the balance should be filtered. This method is lengthy, but the extra trouble taken results in a clean solution and better deposits.

LITERATURE ON ELECTRO-DEPOSITION OF NICKEL

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Plating Room Equipment

Layout, Equipment and Supplies Necessary for a Modern Electro Plating Plant—The Observations of a Practical Plater

Written for The Metal Industry By ROYAL F. CLARK, Foreman Plater

The first requisite for the installation of a modern electro-plating department is the selection of a room, preferably on the ground floor, which should have a high ceiling, windows on all sides, skylights with ventilators, and a cement floor, the center of which must have a sewer connection; all sides of the floor should slope toward the center. Overhead shafting should not be placed directly over the plating tanks, cleaning, pickling, cyanide dip, cold and hot water tanks. If shaft bearings must be placed over the tanks, pans must be put beneath to catch the dripping oil. The arrangement of the aforementioned tanks will depend upon the mode of procedure and the direction in which the work is to travel.

The ideal plating room should be located in a one story building apart from the main factory. The acid dipping room should adjoin the plating room, and be equipped with a powerful exhaust fan, which will carry off the poisonous fumes arising from the various acid dips. A wooden box not unlike a pipe should run directly back of and along the jars of acid up to the exhaust fan, and long narrow holes must be cut in this box directly over each jar. The box and fan must be painted inside and outside with black asphaltum.

This room should be equipped with a tank of strong caustic soda solution, an electric cleaner, a cyanide dip, pickle to remove rust from iron and steel, a nickel and silver stripping solution and a separate tank of cold water to plunge the work into before the final rinsing in hot water. A steam heated sawdust box should also be included in this equipment.

In the plating department the cold water rinsing tank should be long and have several partitions of lower levels. Water should enter through the bottom of the first compartment. If the faucet is over the tank, a pipe connected to it can extend to within a few inches of the bottom.

A motor generator set should be placed upon a concrete foundation and it may be of the 2 or 3 wire system type of current distribution. The generator should be of ample capacity to prevent overloading the machine. For instance if 2,000 amperes will be used when all the tanks

are filled, a 3,000 ampere generator should be installed. A 3,000 ampere ammeter should be in the main line, also a voltmeter having the scale from zero to 15 volts. Flexible copper cable should be used for the main bus bars, also for the wiring leading to the tanks. When taking off taps from the bus cable they should be soldered and thoroughly wrapped with rubber friction tape. Each tank should be equipped with a volt and ammeter, and a rheostat which will carry the current without excessive heating. Copper bars should be used for the anode and cathode rods. For silver solutions the anode rods can be of iron or steel and immersed in the silver electrolyte with the silver anodes suspended from iron hooks which in turn hang from the anode bar. Or the anode rods may be of copper with bronze connections from which steel hooks hang into the solution far enough to allow the entire silver anode to be submerged. Brass tubing of ample current carrying capacity may be used where great strength is needed for the anode and cathode rods.

All plating tanks should be lined with sheet lead with the seams burned in; then given a thick coating of tank lining, and be raised from about six to eight inches from the floor.

This article will be continued in an early issue.—Ed.

Abrasives in Bronze Bushings

A recent issue of Grits and Grinds, published by the Norton, Company, Worcester, Mass., described an investigation to find out if abrasive particles became imbedded in bronze bushings as a result of grinding. Three bronze bushings were ground by wheels varying in hardness and fineness. The bushings were then cut with a hacksaw and one-half of each bushing examined chemically, the other half being placed under the microscope. It was found that by neither method could the presence of abrasives be detected, leading to the conclusion that grinding does not leave abrasive particles imbedded in bronze bushings.

The Electro-Plating Industry in 1923

A Review of Technical and Economic Developments During the Past Year

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

The year of 1923 can be summed up as an unusually good business year in all lines of manufactured products. There was some reaction in late August, but almost a full recovery by the latter part of September. In all lines of the metal industry that the writer came in contact with there was apparently all the business that could be taken care of, and many firms were either working night shifts or overtime to meet the demand. The automobile and the building industries have been unusually busy. These and allied industries, together with the silver-plate, metal novelty and a hundred other industries, in which electro-plating in one form or another has become an important factor, have created an unusual demand for electro-plated products which is constantly on the increase. Especially is this true of the automobile industry.

Nickel is still the predominating factor as a finish for all plated products used in automobile production except such parts as rims, nuts, bolts, etc., that must be protected from atmospheric corrosion. Electro-deposited zinc is still the most important non-corrosive protection. For closed cars which now have a variety of metal parts, the nickel deposit is still the most important. Also, a number of new finishes have been developed in which nickel is used. These finishes are the silver gray, the platinoid, and the brush and sand blasted antique finishes. In the higher grade of closed cars, gold and silver finishes, usually in combination with colored enamels are becoming very popular. Where black rust-proof finishes are desired, the Parker process apparently is still the leader.

In the hardware industry business has been unusually good, especially in builders' hardware, which covers both interior and exterior metal goods. The finishes have shown but little change during the past few years. The antique finishes in brass, copper and bronze still predominate. In the higher grade of hardware, silver and gold finishes are used. The base metal is usually bronze or a low brass mixture. There is still a great deal of room for improvement, however, in the plating of steel hardware exposed to the atmosphere if its usefulness is to be extended. Some of these products become rusted so badly within a few months that they become worthless. In the plumbing hardware industry, nickel deposit is still the important metal for finishing, and will, no doubt, continue to be so until the deposition of chromium becomes a commercial, instead of a laboratory experiment. Many firms in the plumbing hardware line have commenced to standardize their nickel deposits and give a guarantee with their product, which augurs well for the future. In the lighting fixture industry, business still continues to be near the one hundred per cent mark. Designs are more elaborate than in former years. The Polychrome finish is still dominating, but a variety of antique finishes still continue with an endless list of ancient names that prove attractive to the buyer. Silver deposits have constantly increased in demand and the brush and Butler finishes are still popular. Gold is now used on the higher grade lighting fixtures as well as in the art metal industries. The possibilities of sprayed enamel and colored lacquer finishes in all lines of metal craft are still growing.

The demand for metal trimmings in the furniture industry has been unusually good during the past year and apparently will continue during the coming year. This

class of metal goods is produced in endless designs to meet popular taste for period furniture in a variety of woods and finishes. The English burnt brass finish has been and will continue to be a very popular finish for period furniture; antique gold, brass, bronze and silver finishes continue to be the finishes in demand.

In the jewelry trades platinum is still the king of metals for articles of personal adornment, and as the high price of the metal still continues, the demand for platinum jewelry still continues to be unusually good. White gold is a very distinctive metal, and is used to a great extent. Antique green gold finishes of all shades still continue to be popular as are Roman, rose gold and bright gold. The demand for products in the jewelry and allied lines should continue to be excellent in 1924.

In the silver plating industry, which covers the hollowware, flatware and novelty lines, business has been unusually good during the past year and should remain so through 1924. Popular finishes have been the Sheffield, Butler and platinum gray with the usual burnished and bright finishes. Dutch antique finish is still in excellent demand as well as the usual antique silver. In my opinion, the price of silver will increase during the present year, and there is a great possibility of again seeing silver at one dollar per ounce.

The electro-plating industry will continue to progress and reach higher levels of usefulness. The American Electro-Platers' Society and the Bureau of Standards are doing research work of extraordinary value to the commercial electro-plating industry. The Bureau of Standards should receive the maximum of support from every electro-plater. The American Electro-Platers' Society should receive support from every manufacturer interested in electro-plating and the production of a better plated product. This means not only moral support but financial support to carry on its work and collaborate with the Bureau of Standards. Work is now being carried on by the Bureau of Standards in connection with the advisory committee of the American Electro-Platers' Society covering the solubility of nickel anodes, the determination of the most efficient nickel electrolyte, the deposition of nickel upon zinc and its alloys, the study of throwing power of solutions, and the production of a rust-proof nickel deposit upon steel. These investigations should receive the financial support of the entire automobile industry.

Corrosion is still a very important factor. Chromium, which, it was hoped, would eliminate atmospheric corrosion forever when deposited even in minute amounts upon steel or iron, is still a splendid dream. An English authority commenting upon the value of electro-deposits of chromium said: "I do not think that it will be useful for metals which have to withstand any abrasion or for machine parts subject to friction." During the convention of the American Electro-Platers' Society at Providence, R. I., July 2-4, a statement was made that if all the steel parts that composed the Brooklyn suspension bridge had been chromium plated with even a thin film of the metal, corrosion could never have resulted, and the work of painters that has continued since the opening of the bridge to the public in 1883 would have been unnecessary. The author of the statement evidently failed to realize that there is a constant abrasion of the surface. Constant vibration produces friction, especially where the

parts of the bridge are bolted together. Bunsen in 1850 first produced an electro-deposit of chromium. Carveth and Curry carried out extensive experiments under the auspices of the American Electrochemical Society in 1905 on chromium and the electrolysis of chromic acid. Very little work was done since then, until 1920. Considerable investigation has been carried on, however, in Germany and England.

Two very interesting articles covering the various phases of experiments carried on since then will be found in *THE METAL INDUSTRY* for 1923. "Chromium Plating," a paper on the properties of chromium and methods of electro-deposition by R. E. Search, March, 1923, pages 109-111, and "Chromium Plating Steel," the story of chromium deposition using chromium anodes, and the properties of the deposit by K. W. Schwartz, November, 1923, pages 441-443. Apparently in all experiments so far made, the chromium electrolyte prescribed by Sargent gives the most satisfactory and efficient results. The formula and current details can be found in the conclusions of Schwartz's article. Richard Grah, a practical electro-plater of Sheffield, England, has developed a chromium plating solution for which is claimed superior results to all other solutions of chromium so far developed, but nothing so far is known of the composition of Grah's solution. It has been reported on good authority from England that a company is now forming to exploit Grah's method.

Chromium evidently will not withstand the action of chlorine solutions. A splendid specimen of chromium plated steel recently reached the United States. The color was equal to the very best type of a white nickel deposit, leaning slightly towards platinum. It was claimed that the article had a chromium deposit of one-thousandth of an inch thick, and would withstand the action of the commercial acids and atmospheric corrosion indefinitely. It was decided to make a test as to its resistant qualities in a new corrosion test for zinc-plated steel recently developed. The time of immersion was 20 seconds at an interval of 30 minutes during which time the articles so immersed have ample time to continue to corrode until they become atmospherically dry. The testing apparatus

was constructed to give the intermittent immersions of 20 seconds in the solution and an atmospheric corrosion action during the drying period of 30 minutes. The chromium plated article in question rusted badly, in sections, in five hours by the methods outlined; the total 20-second immersions were twenty. The question arose, in view of all the statements that have been previously made as to the non-corrosive value of chromium, whether the deposit was actually pure chromium. This will be determined by analysis. If the deposit proves to be a pure deposit of chromium and not an alloy, it will be very interesting to learn what those persons who have been deeply interested in the electro-deposition of chromium from the chemical standpoint have to say regarding this most conclusive corrosive test. A deposit of equal thickness of zinc deposited from a zinc cyanide solution consisting of from 1 to 2 per cent of mercury and 98-99% zinc would have resisted the same test for at least 100 hours.

In reviewing the electro-plating industry for the past year with a knowledge of what has been accomplished and passed into history, it might be as well for a moment or two to glance into the future. From careful observation of conditions as I found them in the metal industry during the latter part of 1923 in the industrial sections of the Middle West, I am led to believe that for a period covering most of 1924 there should be an unusual amount of business in every line of manufacture and labor will be in great demand everywhere. There may be a shortage of every class of labor as late as October, when business may slow up and continue slow, and labor will be far in excess of the demand. This condition should continue possibly throughout 1925, when again business may show improvement through 1926. The law of supply and demand is still the governing factor of our commercial life. If labor can be brought to realize that during the coming year when business will reach its zenith, he should save as many dollars as possible, by the aid of the dollars so saved, when the reaction in business comes, he will still be able to be a part of the purchasing power which will assist in keeping up demand for manufactured products.

Aluminum in 1923

Written for The Metal Industry by ALUMINUM MAN

In our review of the aluminum industry for 1922, it was predicted that business for the year 1923 would not be normal until toward the end of the year. This prediction has proved to be approximately correct, although some lines of business are still below what might be regarded their normal level.

Prices continued substantially uniform throughout the year, although one price increase of one cent per pound was announced in October.

No new factories were built during the year for the production of ingot or sheet, due no doubt to the entire adequacy of existing plants to meet the demand. The main increase was centered in the development of certain lines of manufacture mentioned in last year's review. Among these may be mentioned particularly the strong alloys. This work has been progressing quietly but steadily for the past four years. The results, however, were brought rather forcibly to the attention of the public by the flight of the ZR-1, now christened the Shenandoah, from Lakehurst to St. Louis and return, and by other flights made by this ship. The frame work together with practically all of the metallic parts of this ship are made of 17-S

manufactured by the Aluminum Company of America at its plant at New Kensington, Pa.

In last year's report it was stated that the Aluminum Screw Machine Products Company of Edgewater, N. J., had started operation. This company has increased its output and is marketing a wide variety of screw machine products of strong aluminum alloy.

It is reported that the Aluminum Company of America is operating its rolling mill at Arnold, Pa., for the production of 17-S and other high strength alloys which have been developed by this company, and is prepared to furnish plate in commercial sizes.

While the immediate prospects for 1924 appear fair, there are many elements of uncertainty in the financial situation not only within the United States but with regard to general economic conditions of other countries.

Silver Market

The "Review of the Silver Market for 1923" has just been issued by Handy and Harman, silver refiners, of New York. We shall publish an abstract in an early issue.

Standardization of Plumbing Brass

A Report of the 35th Annual Convention of the National Association of Brass Manufacturers in New York, December 11-13, 1923

The 35th Annual Convention of the National Association of Brass Manufacturers came to a close on Thursday, December 13, after a busy three days' session at Hotel Astor, New York City.

Among the more important matters handled at the convention was the new and up-to-date nomenclature of articles manufactured by members of the Association, as follows:

FORMERLY CALLED	NAMES ADOPTED
Bibbs	Faucets.
Stops	Stops.
Stop and Wastes	Stop and Drains.
Lavatory Stops	Lavatory Stops.
Reversible Stop and Stop and Wastes	Reversible Stop and Stop and Drains.
Self-Closing Stops	Self-Closing Stops.
Urinal Cocks	Urinal Stops.
Sill Cocks	Lawn Faucets.
Garden Hose Valves	Garden Hose Faucets.
Boiler Drain Cocks	Sediment Faucets.
Ball Cocks	Float Valves.
Drain and Well Water Cocks	Drain and Well Water Valves.
Basin Cocks	Lavatory Faucets.
Bracket Basin Cocks	Bracket Lavatory Stops.
Pantry Cocks	Pantry Faucets.
Double Pantry Cocks	Double Pantry Faucets.
Double Basin Cocks	Double Lavatory Faucets.
Double Shampoo Cocks	Double Lavatory Shampoo Faucets.
Slop Sink Cocks	Slop Sink Faucets.
Bath Cocks	Bath Faucets.
Ground Key Stops	Ground Key Stops.
Ground Key Stop and Wastes	Ground Key Stop & Drains.
Corporation Cocks	Corporation Stops.
Gas Service and Meter Cocks	Gas Service and Meter Stops.

Recommend 2" opening for legless tubs, and that the tube waste on Built-In Tub fixtures not less than 17 gauge.

The question of grading of goods was given consideration, and the final conclusion was it is not a practical

proposition and cannot be put into successful operation.

The percentage of men employed now as paralleled with that of last Spring, wages paid, hours worked, present and future business conditions, was presented in the Commissioner's report under geographical sections of the country, which proved interesting.

New offices were created by electing representatives from the National Association of Brass Manufacturers to the Eastern Supply and the Central Supply Associations. H. E. Speakman, of the Speakman Company, of Wilmington, Delaware, and A. C. Brown, of the Chicago Faucet Company, of Chicago, Illinois, were elected to the associations in the order named.

A telegram was ordered sent to President Calvin Coolidge and Secretary of the Treasury, Andrew W. Mellon, commanding the proposed tax reduction and opposing the soldiers' bonus.

Director Adolph Mueller, in his report on the Trade Extension Bureau, stated that that organization was engaged in a most worthy work and merited the co-operation and aid of all who are engaged in this industry.

ELECTION OF OFFICERS

John B. Brazier, West Virginia, President; H. F. Albers, Ohio, First Vice-President; R. L. Ottke, Pennsylvania, Second Vice-President; D. M. Hamilton, Michigan; E. F. Niedecken, Wisconsin; L. D. Lawnin, Missouri; Joseph Arth, Jr., Ohio; Herman M. Hoelscher, Illinois; Wilson Cary, Maryland.

To the United States Chamber of Commerce:

E. A. Eckhouse, Ohio, Councillor; R. B. Hills, Massachusetts, Delegate.

National Trade Extension Bureau:

L. D. Lawnin, Missouri, Director; L. A. Deutsch, Ohio, Advisory Committee; J. M. McDonald, Jr., Iowa, Advisory Committee.

Next meeting, West Baden Spring Hotel, West Baden Springs, Indiana, March 12, 13 and 14, 1924.

The Bok Peace Plan

Below we print an abstract of the Bok Peace Plan and a ballot for our readers to fill out and mail to the Amer-

ican Peace Award. We know that the metal industries will help by expressing their opinion.

The Committee's Ballot

Printed in THE METAL INDUSTRY

Do you approve the winning plan
in substance?

Yes
No

(Put an X inside the proper box.)

Name Please print name.

Address

City State

Are you a voter?

Mail promptly to
THE AMERICAN PEACE AWARD
342 Madison Avenue, New York City

If you wish to express a fuller opinion also,
please write to the American Peace Award.

THE PLAN IN BRIEF

Proposes—

I. That the United States shall immediately enter the Permanent Court of International Justice under the conditions stated by Secretary Hughes and President Harding in February, 1923.

II. That without becoming a member of the League of Nations as at present constituted, the United States shall offer to extend its present co-operation with the League and participate in the work of the League as a body of mutual counsel under conditions which

1. Substitute moral force and public opinion for the military and economic force originally implied in Articles X, and XVI.
2. Safeguard the Monroe Doctrine.
3. Accept the fact that the United States will assume no obligations under the Treaty of Versailles except by Act of Congress.
4. Propose that membership in the League should be opened to all nations.
5. Provide for the continuing development of international law.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

Retrospective Review of 1923—Outlook for 1924

The year 1923 proved that rises and falls in industrial conditions are still the order of the day. The year started off brightly and the increase was cumulative during the first half of the year. By that time business was spreading along at a rate almost equal to that of 1920; another boom was in progress; unemployment was eliminated. The memory of 1921, however, was too recent to be forgotten, so, aided perhaps by the fact that the Federal Reserve raised its re-discount rate very slightly, business men bethought themselves and decided that it was time to be careful. An interesting situation occurred, therefore, of curtailment of purchases in a rising market. As a result, although activities slowed down somewhat, stocks were kept at a low level and underlying conditions remained sound.

The industries into which metals flow did well in 1923. Building operations continued at an extraordinary pace, due of course, to the shortage which will take some time to overcome. Railroads bought heavily. The automobile industries had an unprecedented year; a condition which no one was able to foresee or to explain, and even agriculture (aside from the wheat-growing and cattle-raising industries) improved markedly.

It was a good year, not only because more business was done, but because industry knew when to call a halt. It is a good sign that there is enough self-control in industry to keep it from overshooting its mark and to know when it has had enough.

METALS IN 1923

In a general way, the trend of metal prices has been upward, with the exception of copper. The copper situation was rather unfortunate. At the beginning of the year there were all hopes for a consistent recovery and rise. This rise occurred but immediately afterward copper slumped sharply, proving that the price was merely speculative and not a true indicator of the conditions of the industry. There are no indications for any startling developments in the near future, probably due as much as anything else to the fact that producers, once more geared up to high production and unable to let down because the magnitude of their operations, are slowly but steadily piling up a surplus of metal. Although this surplus is now only about 300 million pounds (the same as it was last year at this time) it shows an increase over the stocks on hand of several months ago. In spite of the unprecedent domestic consumption of copper, the increased facilities and wartime expansion have placed the producing capacity far ahead of American consumption. It seems to be the general opinion that the only thing which will cause a permanent revival in the copper market is the settlement of the European difficulties.

The zinc market is also very dependent upon foreign conditions. The long and the short of the zinc situation

is the same as that of copper. There is more metal to be produced than the world can consume at the present time, and only the stabilizing of conditions abroad and the resumption of buying by the countries which have been forced to cease, will improve the market.

Tin had its usual speculative career, starting a little below 40 cents, going up to 48½ cents, back to less than 38 cents and then upward again, closing the year at about 47½ cents. Lead had a prosperous year due to the enormous consumption of the metal in such products as storage batteries and paints. Platinum has been steady all year and high in price, closing the year at \$125.00. Aluminum also had a steady trend, tending to higher levels, since the adoption of the new tariff in 1922.

Nickel was the one important metal to take a sharp reduction in price and to hold it. Antimony has been a consistent gainer all year, closing in December quite high, almost 9 cents.

Silver, in spite of the predictions that it would drop far below the price of foreign metal after the expiration of the Pittman Act, held up well, and with minor fluctuations averaged about 65 cents during the year.

A complete analysis of the metal market will be found in the Metal Market Review on page 47 of this issue.

TECHNICAL ADVANCEMENTS

The outstanding feature of research work in metals continued to be the investigation of the constitution of metals and alloys by the x-ray. Metallography has taken a long step forward by the use of this instrument. Centrifugal casting continued to be widely discussed. The possibilities of this process are gradually becoming known and there is no longer any question that it will take an important place in the metal manufacturing industry. A considerable amount of very important work is being done by the American Society for Testing Materials in standardizing testing methods. Sub-Committee 3 Committee B-2 of the Society is working on a standard test bar for Monel metal, manganese bronze, brass, aluminum alloys, etc.

A most important piece of research is the molding sands investigation of the American Foundrymen's Association. This is a comprehensive survey of the whole field of moldings sands, both American and foreign, which is leading to a set of standardized tests for sands to use under various conditions. These papers were read at the meeting of the American Foundrymen's Association, April 28th-May 3rd, 1923, in Cleveland, Ohio, describing the work done by the Joint Committee on Molding Sand Research. Another important piece of work was the compilation of A List of Alloys by Prof. Wm. Campbell of Columbia University, for the American Society for Testing Materials. This List is the first attempt in the United States to gather within one book, all the alloys of importance on the market.

Advances in the plating industry have been numerous. The Research Committee of the American Electro-Platers' Society in co-operation with the Bureau of Standards is carrying on experiments, seeking improvement of nickel plating. The work on nickel deposition covers the acidity of solutions, effects of impurities, nickel anodes, conductivity, deposition of nickel on zinc, prepara-

tion of pure nickel and specifications for nickel plating. In addition to this, the Bureau is carrying on researches as follows: Current distribution and throwing power; structure of deposits; effective base-metal structure; platinum deposition.

The problem of depositing metallic chromium has attracted a great deal of attention within the past year. The paper on Chromium Deposition by Schwartz at the last meeting of the American Electrochemical Society outlined a method which seemed to show up well in the laboratory. The successful deposition of chromium opens an enormous field for the plating industry because of the unusual powers of resistance of this material. Further developments will be watched with interest, although at the present time, the process is admittedly not yet commercial. Considerable work is being done on electrodeposition of iron for such purposes as the building up of worn parts of machinery, but this is so far restricted to very few concerns.

Continued interest has been displayed in the use of magnesium as an engineering material. Although the commercial development of this material may be slow, it seems that eventually it is bound to resume its proper place.

One field which is attracting attention in Great Britain and which will probably be of some importance in the United States is that of the production of untarnishable or so-called stainless materials. At the present time, iron and silver seem to be the object of the most attention but others will undoubtedly come in for their share.

ECONOMIC DEVELOPMENTS

As matters of immediate interest to those engaged in manufacturing metals, three general topics demand attention. One is that of honest metal composition, in other words, selling and purchasing of metals and metal products for what they actually contain rather than what they seem to or are said to contain. We have laws regulating the selling of inferior silver and Sterling silver. There should also be laws regulating the sale, for example, of brass and copper-plated objects as against solid metal. Another point along the same lines is that of guaranteed electro-plating. Electro-plated objects should be sold on specification either for weight of metal deposited per unit of area, thickness of coating, or ability to stand up under certain standard tests. This was advocated by Charles H. Proctor, Plating-Chemical Editor of this journal, a few months ago before the annual convention of the American Electro-Platers' Society. The third movement which demands support is that of the use of correct nomenclature for metals and metal processes. The vast number of names on the market, a large number which crop up and die off in short lengths of time, have created a situation which has caused most of those engaged in the industry to throw up their hands in disgust. There are too many fancy names for fancy mixtures. Let us get down to a small number of standard combinations which will serve all our purposes. In this respect, the work of the American Society for Testing Materials is most commendable. In addition let us call processes and metals by their correct names. To be sure "galvanizing" is one of the oldest terms in the metal industries. Nevertheless, it means zining, and it should be called that. Differentiation can easily be made between hot zining, electro-zining, sherardizing or dust-zining, and other methods of application, but let us at least start soundly and consistently from a scientific basis.

NECROLOGY

Among the men of prominence in the metal industries

who passed away during 1923 were: Edward Crosby Darling, vice-president of the Aluminum Company of America, Pittsburgh, Pa.; William M. Cramp of the Wm. Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa.; Prof. Hans Goldschmidt, inventor of the Thermit process; Chauncey C. Baldwin, vice-president Standard Underground Cable Company, Perth Amboy, N. J.; C. L. Wagandt, director National Enameling and Stamping Company, Baltimore, Md.; Walter Monteith Aikman, chairman of the board Central Stamping Company, New York; Wm. Edmond Curtis, director, Scovill Manufacturing Company, Waterbury, Conn.; Dr. Charles P. Steinmetz, chief consulting engineer General Electric Company, Schenectady, N. Y.; Albert Reid Ledoux, president Ledoux and Company, Inc., New York; F. N. Perkins, formerly president of the Foundry Supply Association, also of the Foundry Machine and Exhibition Company; James Samuel Elton, director, American Brass Company, Waterbury, Conn.; Arthur L. Stark, vice-president Harshaw, Fuller & Goodwin Company, Elyria, Ohio; Charles S. Platt, formerly a prominent silver and gold refiner and roller of New York.

OUTLOOK FOR 1924

The general concensus of well-informed opinion seems to be that 1924 will be a sound, steady, and on the whole, prosperous year. Metals have for some time been on a solid, if rather low basis, and the ever-present, though perhaps faint, hope that Europe will put its house in order, serves to console those who are dissatisfied with present prices. The railroads have had a good year, can afford to buy freely for their needs. Electrical industries have never failed even through the worst times. The building industry has two or three big years still ahead of it. Automobiles—but there all predictions are valueless. Cautious observers will prepare for a slump, but this industry has made too many prophets look foolish in the past for anyone to risk a definite prediction.

Secretary Hoover believes that the economic outlook for United States is bright. According to the pamphlet on Economic Conditions issued by the National City Bank of New York, "Evidences have multiplied that instead of running into a quiet period, the industries are likely to continue through the winter at a good rate of operation and there is little doubt that spring will give renewed impetus to all activities."

It seems also possible to hope that the old bugbear of a presidential year will be laid at rest for four years at any rate. A plan for tax reduction put forth by Secretary Mellon and the prompt assistance given to this plan by President Coolidge in his message to Congress sounds a note of relief and encouragement for business. It is noteworthy also that the party in opposition has taken up the same principle, namely that of tax reduction, but with a few variations. So far as business is concerned it matters little how taxes are reduced so long as they are reduced sufficiently. There is every prospect for this to happen. No matter how the election turns, this means that business will go on, politics or no politics.

THE METAL INDUSTRY OF AGE

This issue marks the end of the twenty-first year of THE METAL INDUSTRY. We have reached our majority.

Although it is customary to make new resolutions at the New Year, and particularly at one's twenty-first New Year, we must admit that we are making none. Our old slogan still serves. We shall continue to do everything in our power to make THE METAL INDUSTRY bigger, better and more interesting than ever.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

STREAKY BRASS BEDSTEADS

To the Editor of THE METAL INDUSTRY:

On page 445 of your November issue there is an article on Streaky Brass Bedsteads. I wish to say that about 23 years ago I was with an iron and brass bed company in Michigan, and we had about the same trouble. We eliminated some of this trouble as follows: Make a paste of kerosene and graphite; apply same on the iron rods or tubes, previous to placing the brass shells on. This will keep the iron a long time without rusting. We then polished our brass as follows: 150 emery, and oiled with 200 emery; afterward buffed and colored and ready for lacquering. If the above is any good to you or anyone, you are welcome to it. Coldwater, Mich., November 15, 1923.

ANDREW V. RE.

Please accept my thanks for the information submitted in your letter of November 15th. This method was finally adopted by the firm which manufactured the cased tubing, and it eliminated the streaks to a great extent.

New York, December 3, 1923.

CHARLES H. PROCTOR.

To the Editor of THE METAL INDUSTRY:

I noticed in the November issue that a firm was having trouble with dark spots appearing on its finished brass beds. I have had the same trouble but overcame same by using denatured alcohol and emery flour for hand buffing. Before the tubes went to be lacquered they were all wiped dry and handled with cotton gloves so that no perspiration marks would show when they were lacquered, as any grease will make dark spots. We always sprayed anything that could be sprayed, but oil should not be used in cutting down tubing as the wall is thin and it will get into the seams. I take the liberty to answer this as I have been connected with one of the large metal bed companies which existed for 17 years until the war put it out of business. Today I am back in my old line again, in charge of brass foundry. Butler, Pa., November 26, 1923.

A. J. REYNERS.

The problem you refer to is entirely different from the problem under discussion. The problem you refer to is one of stains primarily from finger marks in hot, humid weather of summertime. Your ideas are correct, however, for the elimination of surface stains such as finger marks.

The problem under discussion is one of iron rust upon the iron tubing over which the very thin brass tube is drawn to produce what is commercially termed "cased tubing." The iron rust comes through the brass as a red stain. Coating the iron tube with graphite and oil before drawing the thin brass tube over it would, no doubt, solve the problem of the red rust-like stains. This method is outlined above by Mr. Re.

CHARLES H. PROCTOR.

AMERICAN GRAPHITES

To the Editor of THE METAL INDUSTRY:

In reply to your letter of December 10, wish to advise that we have made a great many experiments with American clays and American Flake Graphites in combination. At the present time we are not convinced that the American Flake Graphite can be used to any noticeable advantage. We do, however, have considerable faith in the American clays, as we are still using quite some of this material in our mixtures.

JONATHAN BARTLEY CRUCIBLE COMPANY,
LEWIS H. LAWTON, Secy.

Trenton, N. J., December 12, 1923.

To the Editor of THE METAL INDUSTRY:

Replying to your favor of the 10th inst. in regard to crucibles made out of American Clay and Alabama Graphite, would say, that the tests that were made on this have been nothing but experimental tests, and have not been used in a commercial way. We have found that it is not satisfactory to use all American Clay and Graphite, as we made several tests in a commercial way, and find that the goods were not as uniform as crucibles made by using other materials.

ROSS TACONY CRUCIBLE CO.
HENRY A. ROSS, Pres.
Tacony, Philadelphia, Pa., Dec. 12, 1923.

APPRECIATION FROM JAPAN

To the Editor of THE METAL INDUSTRY:

We thank you very much in acknowledging the receipt of your kind letter dated September 21st, 1923, expressing the profound sympathy for the loss we have sustained in the recent earthquake disaster which has befallen our districts. We are very happy to say that though our business premises were unfortunately destroyed by the terrible fire which followed the quake, none of our members received any injuries and that our business is now going on as active as ever.

Taking this opportunity, we desire to express our heartfelt thanks for the deepest sympathy and wonderful help extended by the people of America for Japan. Indeed, we, Japanese, are deeply moved by the overflowing sympathy of American people whose big, quick helping hand rushed forward to our shore. Words of hearty gratitude and deep appreciation are audible everywhere in this country.

We are, with thousand thanks,
MARUZEN COMPANY, LTD.
Tokyo, Japan, November 6, 1923.

Technical Publications

HAZARD OF FLAMMABLE ALUMINUM DUST

BY DAVID J. PRICE AND ROBERT M. BAKER*

Explosions in industrial plants where clouds of aluminum dust are created, as well as laboratory experiments, have proved that this dust is explosive when ignited, and that it must be handled with caution. The fact that aluminum dust is explosive should be brought to the attention of all industries creating or using an aluminum dust.

The dust reclaiming system as installed in this printing plant

evidently operates successfully, as it was claimed that very little of the aluminum bronze escaped from the duct on the roof. The cyclone dust collector and expansion chamber, however, should have been installed on the outside of the building, because of the dust explosion hazard, and a future installation of this type has been recommended. All joints in the ducts should be made dust tight.

At certain times of the year when the air is dry there is a possibility of static electricity accumulating on the ducts and the machine. As a precaution, grounding the machine and the ducts was recommended. This can be done by connecting a No. 14 copper wire to a bolt in the frame of the machine, and leading the wire to a water pipe close by and soldering the wire to the pipe. This wire should be protected from injury. The cyclone dust collector should also be connected to a water pipe in the same manner.

*Bureau of Chemistry, U. S. Department of Agriculture, Washington, D. C. Reprinted from Chemical and Metallurgical Engineering. Vol. 29, No. 20, November 12, 1923.

A thorough inspection of all electrical equipment by a competent electrician has been recommended, besides the regular inspection by a member of the fire department. Had such an inspection been made before this explosion, no doubt the wire against the metal duct would have been seen and the wiring changed before such an explosion could occur.

CORROSION OF BRASS AND GRAIN SIZE

By ROBERT J. ANDERSON AND GEORGE M. ENOS

This paper which will be read before the New York meeting, February, 1924, of the Institute of Metals Division, describes a series of tests carried out on the corrosion of tin brass, 70:29:1 copper-zinc-tin, of different grain sizes. The accelerated electrolytic corrosion test developed by the writers in the Bureau of Mines was the method employed and several electrolytes were used as the corroding media. Contradictory opinions have been expressed as to the effect of grain size on corrosion, but the experimental data reported here show that, for the brass tested and the corrosive solutions used, the effect of grain size (from 0.01 to 0.10 mm.

diameter) on the corrosion loss is very small and probably can be ignored for practical purposes. In general, however, the brass with smaller grain size tends to corrode less than that with larger grain size. The microstructural aspects of some corroded samples are described.

CORROSION IN MINE WATERS

By ROBERT J. ANDERSON AND GEORGE M. ENOS*

This paper on Corrosion in Mine Waters and Recent Investigations of it by the U. S. Bureau of Mines discusses the problem of corrosion in a general way, especially as applied to the corrosion of metals and alloys in acid mine waters. The several theories of corrosion are discussed and it is pointed out that these do not explain the fundamental cause for corrosion.

Photomicrographs of long-time immersion tests which have been made on 45 metals and alloys are described.

*Read before the Pittsburgh Chapter of the American Society for Steel Treating.

New Books

Industrial Publishing by H. M. Swetland. Published by New York Business Publishers' Association. Size 5 x 8, 289 pages. Price payable in advance \$4.00. For sale by THE METAL INDUSTRY.

It is unusual that a book describing an industry should be written by one of the higher executives of that industry. As a rule this work is either delegated, or for some other reason, done by those who have more academic positions, and perhaps more leisure. Here, however, is the exception to the rule. The author is the president of the United Publishers' Corporation, one of the largest trade journal publishing houses in the world, and dean of the industrial publishing industry. For this reason alone, if no other, the book commands immediate attention.

The author outlines the origin and development of the industrial publishing industry, showing its necessity to modern business, and as a result, the magnitude to which it has grown. He gives a clear definition and analysis of business papers showing their division into the technical papers, which serve the manufacturing industries showing methods of economic production, trade papers, which give methods of successful merchandizing and distribution, and class publications which are outside of the first two groups, but present special matter on organization, system, business training, insurance, banking, etc. He points out that industrial papers have more and more specialized in individual fields, abolishing "trade secrets," raising the standards of business, at the same time raising their own standards.

The work of publishing an industrial paper is divided into four parts—editorial, circulation, advertising and finance. Space limitations make it impossible to outline the detailed descriptions of these activities given by the author, but it is sufficient to state that the book is an authoritative guide and handbook for all those who are either contemplating or actually engaged in the business of publishing industrial journals.

Lead by Sir Edward Thorpe. Published by Longmans, Green & Company. Size 5 3/4 x 8 1/2, 343 pages. Price \$5.25. For sale by THE METAL INDUSTRY.

This book covers the occurrence in nature, modes of its extraction, properties and uses with some account of its principal compounds. It aims at giving, within somewhat restricted limits, the broad outlines of the chemistry of lead. Although American methods of smelting and refining lead are thoroughly covered in Hoffman's Metallurgy of Lead, this book will make an interesting addition to the library, due to the fact that it is based on English practice. A part of the book is devoted to uses and properties of lead and its alloys which makes it interesting to the manufacturer and fabricator of this material. Compounds of lead are covered, such as oxides, carbonates, etc.

Strength and Structure of Steel and Other Metals by W. E.

Dalby. Published by Longmans, Green & Company. Size 5 3/4 x 9, 176 pages. Price payable in advance \$6.00. For sale by THE METAL INDUSTRY.

This book is intended for the testing engineer and will be found a very complete compendium of the tests and testing apparatus used on metals. Chapter 1 covers the various physical tests now in use. Chapter 2 goes into the load-extension diagrams and the inner structure of the metals in common use. Chapter 3 compares tabulated records of strength and ductility and concentrates on the load-extension diagram. Chapter 4 goes into principles of metallography and explains how by their aid, constitutional diagrams are obtained. Chapter 5 covers the elastic and plastic states of metals, showing that every metal furnishes a characteristic loop after overstraining. Chapter 6 is added for designs on the strength of screw threads as reported to the Sub-Committee on Screw Threads of the British Engineering Standards Association in 1917.

Personnel Management, by Walter Dill Scott and Robert C. Clothier. Published by A. W. Shaw Company. 643 pages. Price payable in advance \$4.00. For sale by THE METAL INDUSTRY.

Personnel Management is a comprehensive treatment of the principles of personnel adjustment in industry. It is only within very recent years that manufacturing and industrial plants have begun to give to their men the intelligence and thought that goes without question to the equipment and other phases of management. The management of men has gone by "hunches"; of materials and equipment, by facts.

The treatment in this book is based on the general principle that facts are as essential to intelligent action in handling labor as elsewhere. The authors write from concrete and wide experience. They outline the field for organization of personnel administration, the development of sources of labor supply, the selection and placement of applicants, the follow up of new employees, training, wage determination and line of promotion and the department of health maintenance.

Such facts, or devices for securing and recording facts as are available at present, are treated in detail. Chapter headings read: Constructing the Occupational Description; Construction and Development of the Promotional Chart; Constructing the Application Blank; Constructing the Qualification Card; Developing the Rating Scale; Mental Alertness Tests; the Construction of Special Ability Tests; Constructing the Personnel Control Chart; Education and Training; Use of Personnel Instruments in Salary Control; Significance of Labor Turnover.

The book is illustrated with many charts and diagrams. It should be a very valuable handbook for all engaged in the operation of industrial plants. The reviewer has, however, noted several misspelled proper names among the authors in the full bibliography and references. It seems an unfortunate lapse in so excellent a piece of work.—E. O. B.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical
WILLIAM J. REARDON, Foundry

PETER W. BLAIR, Mechanical
LOUIS J. KROM, Rolling Mill

CHARLES H. PROCTOR, Plating-Chemical
R. E. SEARCH, Exchange-Research

METAL MOLDS

Q.—We desire to obtain a textbook or information in regard to casting white metal in chill moulds for candle sticks. These candle sticks are to be brass plated, nickel plated and silver plated.

A.—Molds for white metal, or antimonial lead (86 parts lead, 14 parts antimony) as well as zinc and britannia metal are made from bronze metal, 90 copper, 9 zinc, 1 tin.

These molds are made in sections, either for solid castings or slush castings, which are light and hollow. This is what you term chill molds. There are several firms in New York that manufacture such molds.

Candlesticks are quite frequently cast in several parts and then soldered together, using a low melting soft solder and a soldering acid composed of zinc chloride, glycerine and alcohol.

It requires experience successfully to produce castings from slush or chill molds. Antimonial lead has the lowest melting point of the white metals, and is used to a great extent.

Zinc gives a good hard metal, which is easier to finish and plate. Britannia metal is used by silverware manufacturers.—C. H. P. Problem—3,281.

PERMANENT MOLDS

Q.—In one of your issues, you published an article entitled "Permanent Molds." With reference to the portion of this article pertaining to the making of molds from asbestos and in particular the following method mentioned:

Sucrate of lime.
Silicate of soda.
Asbestos.

Could you advise me as follows:

1. The proportions of quicklime and sugar solution.
2. The proportions of sucrate of lime and silicate of soda.
3. The proportions of the combination of the above and the asbestos.

Also any other information available regarding the methods of mixing.

A.—1st. To carry out that part of the process relative to the proportions of quicklime and sugar, dissolve a quantity of quicklime in a 10% hot solution of beet sugar, using an excess of lime, so that some of the lime is left undissolved.

2nd. This solution is then diluted with three times its volume of water, and is further mixed with an equal quantity of silicate of soda solution. This is a stock mixture that can be kept in a suitable container that is air-tight.

If you desire to tamp this composition, add sufficient of the sucrate of lime to the asbestos to make it of the consistency of molders' sand, and ram, from which, the pattern, if metal and oiled, can afterwards be picked out. The asbestos and sucrate of lime can be mixed to the consistency so that it will just pour. In the latter case, the pattern should be made from a soft metal fusing somewhere around 400 deg. Fahr., so that it can be melted out when the mold is dry. When the mold is rammed and exposed to the air, it will dry more quickly than the method of pouring the composition will allow.—E. D. G. Problem 3,282.

BALL BURNISHING SOAP

Q.—Can you give me any information on ball burnishing soap to use after brass plating?

A.—The old fashioned whale oil soap, sometimes termed black platers' compound, is an excellent medium for ball burnishing. Soap bark is also used extensively. However, if you desire to obtain a high lustre resembling buffing, then you will have to follow up your ball burnishing with tumbling in sole leather chips to which is added a little Vienna lime. Tumble the leather chips first with the lime (or crocus may be used), then put the tumbled brass plated parts in the dry tumbling barrel with the chips. A very high lustre can be obtained. It is possible that

you can eliminate the ball burnishing, however. Try both methods, with and without.—C. H. P. Problem 3,283.

BLACK ON DURALUMIN

Q.—Have you any information which you could give us concerning the best method of securing a black surface on Duralumin sheet?

A.—It is possible that the same solution that is used in producing a black or gun metal finish upon die castings will answer your purpose.

Such a solution is prepared as follows:

Water	1 gallon
Caustic Soda 73.76%	5 ounces
Powdered White Arsenic	2½ ounces
Sodium Cyanide 96.98%	2 ounces

Temperature 180 to 200 deg. Fahr. Immerse the cleansed articles in the solution until they become black, then remove, wash, dry and lacquer.

BLACK NICKEL SOLUTION

Water	1 gallon
Double Nickel Salts	8 ounces
Sulphocyanide of Sodium	2 "
Zinc Sulphate	1 "
Ammonia Water	½ "
Nickel Anodes, Normal Temperature	
Voltage ½ to 1.	

C. H. P. Problem 3,284.

BLACK ON BRASS

Q.—Can you tell me of a dip blackening for brass, which is to be enameled and baked at 400° Fahr. fused black nickel, also ammonia-copper. They both were good until enameled and baked at 400° Fahr. Then the enamel chipped, taking the black coating with it; at 250° it does not peel.

A.—The ammonia copper carbonate black dip gives the best results as a basic coating for articles made of brass that are finally japanned. The japanned articles must not be heated in excess of 250 degrees Fahr., for the best results, otherwise, and oxidation of the blackened surface occurs which will cause the japan to lose adherence as you have noted. Your only remedy is to heat it to 225 or 250 degrees and if necessary maintain this temperature for a longer duration of time than when 400 degrees Fahr. is used.—C. H. P. Problem 3,285.

BLACK ON SILVER PLATE

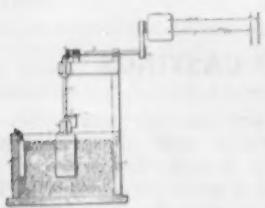
Q.—I have some brass and German silver, top-shaped and letters are stamped on it. The letters have got to show black and the other part white. They want a very cheap silver plate on it. I have been using drop black and varnish, and it feels sticky after the work is finished. Would you please advise me on something better than varnish.

A.—The best material you can use that will give you a dead black finish in the letters on the articles that are silver plated with a very bright deposit, is dead black jap-a-lac. You can purchase this material in any paint store for 15 cents a can or upwards. If the articles you are silver-plating are to be lacquered so much the better. The jap-a-lac dries in a short time. You can remove any excess with a cloth moistened with a mixture of equal parts of turpentine and boiled linseed oil. Keep the jap-a-lac tightly closed when not in use, and thin with turpentine and a little linseed oil when too thick. The only other material you could use would be an ordinary black shoe paste, which could be removed with water. Jap-a-lac will not penetrate lacquer as it is an oil black, but dries as hard as a lacquer.—C. H. P. Problem 3,286.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,473,060. November 6, 1923. Method of Electroplating. Edward N. Taylor, St. Louis, Mo., assignor to Walter A. Zelnicker, St. Louis, Mo.



The method of electro plating which comprises plating the surface of an article in an electro plating solution, permitting the solution to remain substantially quiescent for relatively long periods of time, and forcibly removing foreign matter from said surface during shorter intervening periods.

1,473,208. November 6, 1923. Acid-Resisting Alloy. Alvah W. Clement, East Cleveland, Ohio, assignor to the Cleveland Brass Manufacturing Company, Cleveland Ohio.

An alloy containing principally nickel, cobalt, chromium and iron in which nickel and cobalt are both present in appreciable quantities but combined are not greater than 50% and the chromium is present in an appreciable quantity but not greater than 15%, the balance consisting principally of iron, together with an appreciable quantity of molybdenum but not greater than 10%.

1,473,529. November 6, 1923. Rust-Removing Compound. John J. Varn Buhler, Detroit, Mich.

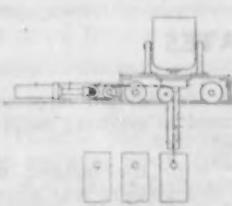
The metal cleaning compound containing glycerine, hydrochloric acid, and alcohol.

1,473,765. November 13, 1923. Buffing Wheel. Theodore W. Hanrath, Chicago, Ill.

A buffing wheel having a plurality of laminations of fabric, face plates for securing the laminations together at the center, the layers being formed of a plurality of sectors stitched together at the edges, substantially all of the threads of the sectors running oblique to the tangents drawn to the circumference at the points where the individual threads terminate, the aggregate angular width of the sectors being somewhat in excess of 360°, thereby producing a moderate fullness and causing the buffing wheel to be thicker at the circumference than toward the center, the laminations lying in surface contact substantially throughout their extent.



1,474,261. November 13, 1923. Pouring or Teeming of Molten Steel or Metal Into Ingot or Like Molds. Harold Heron Hosack, Farnham, England.



Means for pouring or teeming molten metal into ingot or like molds, comprising a stationary ladle, a stationary shield tube through which the metal from the ladle is adapted to fall, a mold adapted to be raised over the tube and subsequently to be lowered in pouring; said shield tube having a detachable lower end.

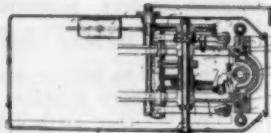
1,474,460. November 20, 1923. Electroplating Anode, Edwin M. Beck, Greensberg, Ind.

An anode for electroplating comprising a substantially cylindrical conductive core and an enveloping body of electroplating metal formed on said core and unitary therewith.



1,474,484. November 20, 1923. Machine for Casting Bushings. Thure Larsson, Worcester, Mass., assignor to Norton Company, Worcester, Mass.

A machine for casting a metal bushing in an abrasive wheel comprising a support for the wheel, means to center wheels of various sizes thereon, means including a movable core which co-operate with the wall defining the hole in said article to form a mold, and means for automatically causing molten metal to flow into said mold.



1,474,953. November 20, 1923. Method for Treating Metal. Ross Edward Bradley and Charles Raymond Webber, Baltimore, Md., assignors to Baltimore Tube Company, Inc., Baltimore, Md.

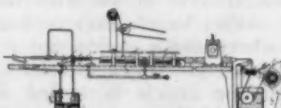


The method of treating tubes composed of copper or the alloys of copper, which consists in subjecting the same to an electric current, under relative conditions of voltage and amperage substantially as specified, and correlating the expansion of the metal treated, and the period of current flow, substantially as described.

1,475,198. November 27, 1923. Electroplating Apparatus. Louis Potthoff, deceased; by Hamilton Trust Company, executor, a corporation of Brooklyn, N. Y. In an apparatus for electroplating flat circular articles, the combination with a plurality of supporting tracks, guides extending parallel to said tracks to sustain the article in upright position, and conveying means for continuously rolling a number of parallel rows of articles along said tracks and between said guides.



1,475,258. November 27, 1923. Method of Manufacturing Soldered Tube. Harry W. Bundy, Detroit, Mich.



The method of manufacturing soldered tube which comprises the longitudinal moving of the tube in a substantially straight line and heating the moving tube to a relatively high heat independently of any heat derived from solder and then flowing a stream of solder onto the same and around the tube.

The method of manufacturing soldered tube which comprises the longitudinal moving of the tube in a substantially straight line and heating the moving tube to a relatively high heat independently of any heat derived from solder and then flowing a stream of solder onto the same and around the tube.

1,475,372. November 27, 1923. Apparatus for Applying Coating. Herbert W. Day, Wollaston, Mass., assignor to Spray Engineering Company, Boston, Mass.

Means for applying coating comprising a body having means for supplying coating material, and having means to subject the same to the action of a motive agent, thereby effecting the discharge of the coating material, and means mounted for complete circumferential movement about said body to discharge a motive agent supplementally upon the discharged coating material at any angle.

1,475,422. November 27, 1923. Process for Refining Tin and Antimony. George Bonnard, Plombieres St. Marcel, France.

The herein described process of refining tin and antimony which comprises subjecting crude tin to the action of dry-chlorine, separating the liquid chlorides thus obtained from the solid and semi-solid materials, adding water to said liquid mixtures to produce a solution of stannic chloride and decompose the chlorides of antimony, arsenic and sulphur, separating out the solution of stannic chloride and electrolytically obtaining tin from such solution.

1,475,973. December 4, 1923. **Process of Electrodeposition.** Bertrand S. Summers, Port Huron, Mich.

In a process of electrodeposition, passing an electric current through a bath containing in solution a compound of the metal to be plated to the object to be plated connected as the cathode from an anode of the plating metal and an anode of the metal to be plated.

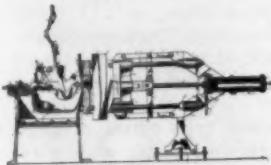
1,475,996. December 4, 1923. **Apparatus for Casting Dental Plates in Metal.** Herbert Leslie Hobday and Frederick William Nunn, Melbourne, Victoria, Australia.

In a machine for casting dental plates, a basket on the end of rigid rod secured to and depending from a rotatable spindle, a ring secured to the lower part of the basket sides, bayonet points in the ring, a socket plate arranged in and detachably connected to the ring, and a hollow flanged member fitting within the socket plate and arranged to accommodate investment pots of varying diameters.

1,476,192. December 4, 1923. **Method of Casting Light Metal Alloys.** William R. Veazey, Cleveland, Ohio, and Edward C. Burdick, Midland, Mich., assignors to the Dow Chemical Company, Midland, Mich.

In a method of casting magnesium and alloys thereof, in which magnesium largely predominates, the steps which consist in melting a quantity of the metal, floating same in a bath of flux, and then transferring metal from such floating mass to the mold as required.

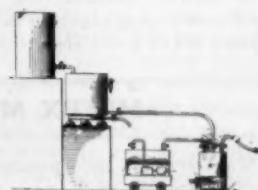
1,476,257. December 4, 1923. **Die-Casting Apparatus.** John Kralund and Clarence H. Duckworth, Brooklyn, N. Y., assignors to Doebler Die Casting Company, Brooklyn, N. Y.



In die-casting apparatus, the combination of a molten metal container, a plurality of carrier devices mounted in parallel relation above said container, having hollow interiors, mouths at the front and compressed air connections at the rear, means for swinging said devices simultaneously, so that said mouths will be submerged within the molten metal in the container in one position and will be registered with die openings in another position, and means for adjusting the positions of said devices independently.

1,476,909. December 11, 1923. **Method of Removing Paint, Enamel, Etc.** Landon C. Moore and William T. Jackson, Dallas, Tex., said Jackson assignor to said Moore.

A process of removing finish coating from a finished-coated surface, which comprises atomizing against such surface, by the agency of a blast of air, an alkaline liquor capable of disintegrating the said finish coating, and such liquor being hot when applied to said surface, such liquor comprising a solution of an alkali metal hydroxid and an alkaline earth metal hydroxid.



1,477,508. December 11, 1923. **Process and Device for Making Sharply-Defined Castings.** Hugo Lohmann, Berlin-Johannisthal, Germany.

The process of manufacturing sharply defined castings which consists in fusing difficultly fusible metallic masses, submitting the fused mass to centrifugal action, and receiving the centrifuged fused mass into molds.

1,477,922. December 18, 1923. **Treating Magnesium and Alloys Comprising the Same.** Emil Wollner, Schwanheim-on-the-Main, and Felix Thomas, Frankfort-on-the-Main, Germany, assignors to the firm: Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany.

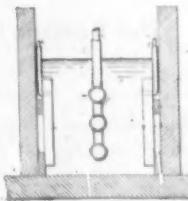
The method of rendering metal containing magnesium resistive against atmospheric influences, consisting in forming on the metal a protective layer of a magnesium salt of an acid capable of forming a soap.

1,477,064. December 11, 1923. **Manufacture of Cores for Foundry Work.** Emil Kleinschmidt, Frankfort-on-the-Main, and Carl Fohr, Miesbach, Oberbayern, Germany.

Core material for foundry work containing in intimately mixed condition a binding agent comminuted to a substantially impalpable powder.

1,477,109. December 11, 1923. **Process for the Manufacture of Zinc Cylinders for Primary Batteries.** Sherard Osborn Copper-Coles, Sunbury-on-Thames, England.

A process for the manufacture of zinc cylinders for use for the primary batteries of flash lamps and for other purposes, consisting in electro-depositing zinc cylinders of the required thickness and size on mandrels and preventing the deposited metal from becoming an integral part of the mandrel and then removing the deposited cylinders from the said mandrels and cutting them.



NEW BUREAU OF STANDARDS SAMPLES

The Bureau of Standards is now prepared to issue the following new standard samples:

Sample No. 55—Ingot Iron \$2 per 150 g.

" No. 56—Phosphate Rock \$2 per 75 g.

" No. 62—Manganese Bronze \$3 per 150 g.

Samples may be paid for in advance, with order, or through Parcel Post C. O. D.

The analyses of these samples are as follows: Ingot Iron 0.013 C, 0.019 Mn, 0.003 P, 0.017 S and 0.001 Si; Phosphate Rock 31.33 P_2O_5 , 3.30 Fe_2O_3 , 3.07 Al_2O_3 , 44.83 CaO and 0.40 MgO; Manganese Bronze 59.06 Cu, 35.06 Zn, 1.60 Mn, 1.13 Fe, 1.13 Al, 0.81 Sn, 0.57 Pb, 0.63 Ni and 0.02 Si.

In addition to these standards the following samples will be ready for distribution with provisional certificates on January 1st: No. 57 Refined Silicon, No. 58 75 per cent Ferro-Silicon, No. 59 50 per cent Ferro-silicon, No. 60 Low Carbon Ferro-Vanadium, No. 61 High Carbon Ferro-Vanadium, and Renewal No. 4c Cast Iron.

Sample No. 63 Phosphor Bronze Bearing Metal is in the hands of the co-operating analysts and will be distributed about March 1st.

CASTING CRUCIBLES FOR PLATINUM

Crucibles from which platinum can be successfully cast are now being made at the Bureau of Standards of the Department of Commerce, Washington, D. C. Thorium or zirconium oxide is used. It is ground to a powder and mixed with water and gum. Then it is poured into a plaster mold which absorbs the water from the outside of the mass of slip. When the part thus dried is thick enough the liquid interior is poured out and the crucible dried and fired.

Platinum is melted in an induction furnace, wherein a high frequency current in an outer coil induces strong eddy currents in the platinum itself and these currents heat the metal. The metal is placed in a crucible which must be able to stand the very high temperature produced, but the rest of the furnace is comparatively cool.

Heretofore, in melting platinum in the high frequency furnace it has been most convenient to make the fusion in a depression in a mass of powdered and sometimes slightly sintered refractory. It was not then possible to cast the molten metal as the refractory powder became mixed with the liquid metal during the pouring. The new crucibles eliminate this difficulty and give promise of very satisfactory service for precious metal melting in the high frequency induction furnace.

GOVERNMENT PUBLICATIONS

Abrasive Materials in 1922 by Wm. M. Beach and L. T. Coons, U. S. Geological Survey, Washington, D. C.

Woven Wire Fencings. Simplified production and recommendation principles, issued by the Bureau of Standards, Department of Commerce, Washington, D. C.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

New Electric Furnace

The Radiant Dome Electric Furnace at the Plant of the H. H. Miller Industries Company, Canton, Ohio

By T. F. BAILY

The furnace requirements of the Miller Industries are unusually severe as their product requires a wide range of metals, running from yellow brass, bronze and red brass to alloys containing 50 per cent nickel. This company has been a user of the resistance type furnace for years with success but the slow rate of heating up of the older type was particularly objectionable under their conditions and the range of temperature hardly adequate for melting high nickel alloys.

The requirements laid down for the new installation were more rapid heating up, higher melting rate and higher temperature range. They also desired to have some convenient means for readily renewing the heating element so as to avoid the long delays in repairs formerly experienced when the resistor trough needed to be replaced. They also wished to eliminate the piers for the trough supports used in the old type of resistance furnace, so as to obtain a larger furnace chamber capacity which would be particularly desirable when charging light scrap or turnings. As they occasionally desired to refine metal, it was desirable to have a basic hearth, so that the furnace described below was provided with a magnesite bottom similar to that used in steel melting furnaces. This bottom was baked in place with a temperature of above 3400° F., temperatures being taken by Seger cones placed on the hearth.

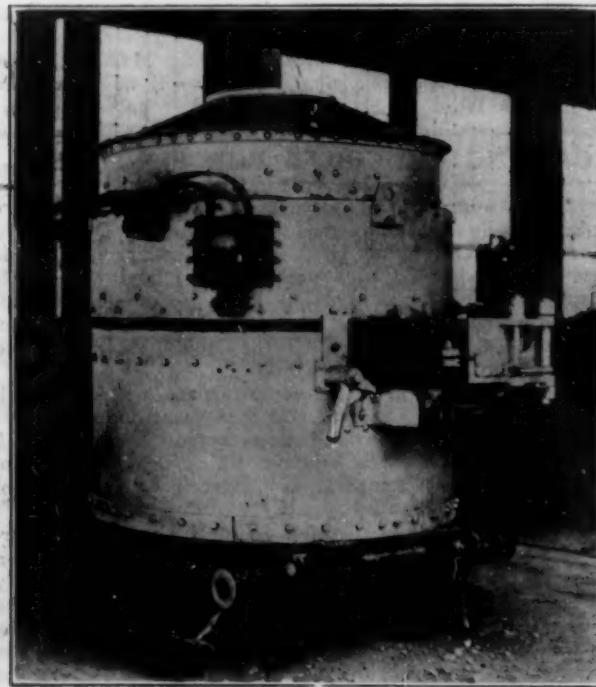
of 100 K. W. per hour or 300 K. W. H. per ton. At full electrical input of 150 K. W. per hour, this furnace has a melting rate of more than 1,000 lbs. per hour and a current consumption of approximately 250 K. W. H. per ton.

The furnace comes from cold to 2,500° F. in eleven hours with an average current input of approximately 80 K. W. per hour, or 880 K. W. H. for the period, and reaches a temperature of 3,400° F. in nineteen hours from cold with an average input of approximately 85 K. W. per hour, or 1,615 K. W. H. for the entire period.

The furnace itself is made in three parts. The base, which contains the magnesite hearth, comes to the top of the door line. The middle section contains the self-supporting heating element, electrodes and terminals. The roof rests directly upon this middle section. When a new resistor ring is required, the roof is removed and the old resistor section taken off and a spare resistor section already prepared is placed in the furnace, the same as though it were a spare roof. To obviate the difficulty experienced in making sound register troughs, the new type resistor container is made of special shaped brick sections, which are readily moulded and baked without danger of cracking in molding and baking.

The furnace is supplied with a rocker type tilting arrangement so that the center of gravity remains in the same plane throughout the pour and as the furnace moves forward, the front lowers and the rear of the furnace raises, the nose of the furnace describing almost the same arc as the stream of metal flowing from the furnace. The tilting of the furnace is done by means of a 2 H.P. motor operating through a double worm reduction, the final worm wheel being keyed to the rear shaft which supports the rear rocker arms.

The operation of this furnace has demonstrated that the former limitations of the resistance type furnace as to melting rate, power consumption and temperature limitations, have been overcome, together with the elimination of long delay in repairs when a resistor trough required renewal.



BAILY RADIANT DOME ELECTRIC BRASS MELTING FURNACE

Although at the present time, only 100 K. W. are available from their power house, the furnace itself has a rating of 150 K. W. capacity and a melting rate of 1,000 lbs. per hour, with a maximum hearth capacity of 2,000 lbs. Their present requirements are for a maximum size heat of 1,000 lbs. and this size of charge of red brass is melted in less than one and one-half hours from pour to pour, with a power consumption

METEX METAL CLEANER

MacDermid, Incorporated, of Waterbury, Conn., are the manufacturers of a new cleaner for use on metals before plating, lacquering, enameling, assembling, etc., called Metex.

The base of Metex is claimed to be a distinctly new product. It has a true colloidal nature and mechano-solvent action.

DIRECTIONS

Still Cleaning.—First bring the water in the cleaning tank to the boiling point. Then dissolve thoroughly, six to eight ounces of Metex Metal Cleaner to each gallon of water.

Electro Cleaning.—Four ounces of Metex Metal Cleaner is usually sufficient where the plating generator is used as an adjunct to the cleaner.

Mechanical Washing Machines.—Where these machines are used, a very small amount of Metex Metal Cleaner, usually from one quarter ounce to two ounces per gallon of water is all that is required for cleaning screw machine products, locks, butts, hinges, oil cups, small tools, typewriter parts, automobile hardware, etc.

Soda Kettles.—Ordinarily one ounce of Metex Metal Cleaner or less to each gallon of water will give the desired results for this class of cleaning.

Tumbling Barrels.—For this work the manufacturers strongly recommend Metex Special No. 1.

Power From Mercury Vapor

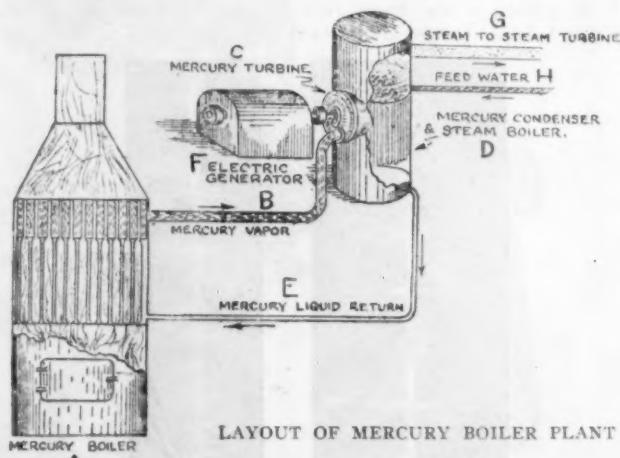
A Description of the New Boiler Developed by the General Electric Company

By W. L. R. EMMETT

Consulting Engineer, General Electric Company

The mercury vapor process, which has been proposed and studied by the writer, has been undergoing experimental development for a number of years but, although an installation on a commercial scale has recently been completed for The Hartford Electric Light Company, it cannot yet be said that a condition suitable to general commercial applications has been reached.

This installation at Hartford has been run two or three times. Some minor troubles have developed which have been easily corrected and there is every indication that the process is adapted to extensive commercial use. Such accomplishment would constitute an important demonstration since the great economies of such a process, if practicable, are obvious.



This process involves the vaporization of mercury in a boiler, driving of a turbine by the mercury vapor and the condensation of the exhaust in a condenser where its latent heat is delivered to water and thus used to generate steam at pressure suitable for use in existing steam plants.

The condensed mercury runs back by gravity into the mercury boiler. Thus the mercury vapor acts as a heat conveyor and, at the same time, delivers energy to the mercury turbine. This affords a means by which the temperature range of operation is more than doubled as compared with ordinary steam processes, and the efficiency consequently greatly increased. Means are also provided by which the flue gases are brought to temperatures equivalent to those used in steam processes by being carried through a superheater and a feed water heater.

An application of this process on a large scale was built at Schenectady and operated experimentally on many occasions although it has not yet been brought to a condition where it is suitable for continuous operation. This equipment was originally designed to give 1,500 K. W. from the mercury turbine but it was never run above 1,050 K. W. owing to certain limitations which developed in the mercury boiler and which have prevented continuous operation.

Of the 1,050 K. W. so delivered in these tests, 800 constitutes net gain as compared with a 200 lb. steam process operating with similar firing conditions. With such a performance of the mercury turbine, and with the steam produced used as in the best power stations, this result is equivalent to about 11,300 B. T. U. for fuel per kilowatt hour; 18,000 B. T. U. per kilowatt hour is considered extremely good in large existing steam stations. This equipment operated with about 12 lbs. pressure in mercury boiler. By using a pressure of 35 lbs. gauge in the mercury vapor, which seems to be possible, the efficiency could be considerably increased.

The possible rate of gain which may be accomplished by proposed mercury vapor process, as compared with steam plants, is naturally dependent upon the conditions and effi-

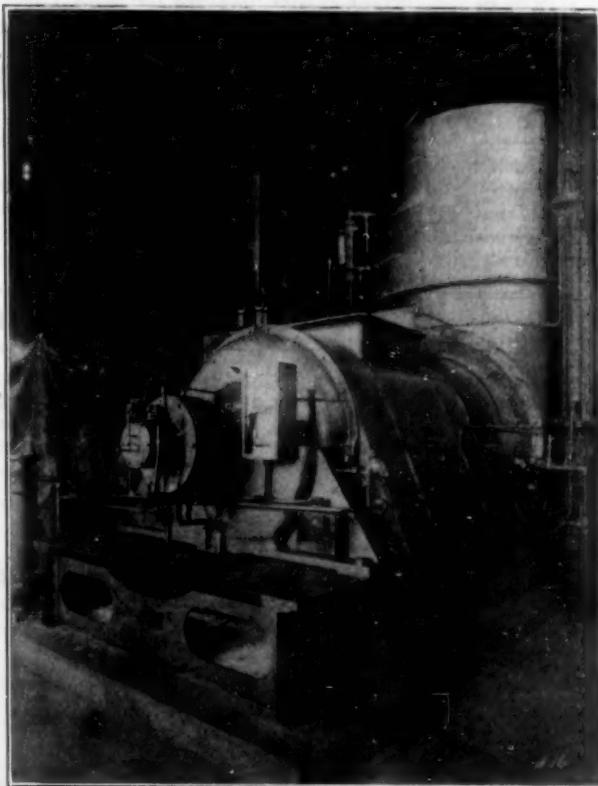
ciency of the plant with which comparison is made. To give an idea of the possibilities it may be said that, if we compare with a steam turbine generating plant, using 200 lbs. steam pressure, with the highest standards of efficiency in turbines and auxiliaries, the mercury steam combination with 35 lbs. gauge pressure in mercury vapor should give about 52% more output in electricity per pound of fuel. And, if in such a plant the boiler room is re-equipped with furnaces and mercury apparatus arranged to burn 18% more fuel, the station capacity with the same steam turbines, condensers, auxiliaries, etc., would be increased about 80%.

The development of such a process involves a very large amount of experimentation and development of experience, both in methods of construction and the proportioning of boilers, condensers, etc.

A paper predicting the possibilities of this process was published in 1914 and can be found in the Proceedings of the American Institute of Electrical Engineers, Vol. XXXII, No. 2, and in the January and February, 1914, numbers of the General Electric Review.

The equipment at Hartford is designed to give about 1,800 kilowatts from the mercury boiler and, in doing so, to deliver about 28,000 lbs. of steam to the station at 200 lbs. pressure and 100° superheat. The maximum load which has so far been carried is 1,500 K. W. and, since the action of the boiler has not been exactly consistent with that of similar experimental boilers, upon which its design was based, it may be found necessary to reduce still further the load for continued operation, and also to modify the firing conditions in order that experience with continued operation may be had.

If the Hartford equipment operated as intended, it would require about 8 lbs. of mercury per kilowatt of capacity from mercury and steam. Since it was designed, much experimental



MERCURY TURBINE

data has been obtained which indicates that the process might be operated on a large scale with less than 5 lbs. of mercury per kilowatt of capacity.

The requirements of a successful application of this process may be stated as follows:

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The requirements of a successful application of this process may be stated as follows:

First—A boiler which, with a quantity of mercury not prohibitive in weight and cost, will produce vapor without overheating and without injurious expansion strains for indefinite periods of time, under most severe conditions of firing which

can be applied to it under any sort of working conditions.

Second—A system of circulation by which all liquid will immediately return to the boiler, which will be kept full.

Third—Arrangements by which the mercury is protected from oxidation. (A gas seal at all points where air can enter the system is the method which I have used).

Fourth—A construction in which all joints are welded or otherwise made in such a manner that mercury vapor cannot escape and air cannot leak into the vacuum spaces.

If these needs can be provided for, the process should be simple and practical for application to a variety of purposes. Its possible efficiency is approximately equivalent to that of internal combustion engines and it uses only simple rotation and is applicable with any kind of fuel.

BELKE PORCELAIN ENAMELED RACKS

The Belke Manufacturing Company, 2952 W. Van Buren street, Chicago, Ill., is offering to the plating world the new Belke Porcelain Enameled Racks with their interchangeable tips.

Platers have always been confronted with the problem of how to suspend their work in the tanks most economically. As a result, hundreds of different racks are used for as many different articles. This rack, it is claimed, will overcome the difficulties experienced by the common wire rack, and will reduce the quantity and consolidate them in a basic few. The main and superstructure of the Belke Rack is insulated from plating action and has adjustable conducting tips, that can be varied to suit the job for the articles to be plated. Itemized, the benefits claimed can be divided into two classes—that derived by the use of the porcelain coating, and that from the use of interchangeable tips.

BENEFITS OF PORCELAIN ENAMELED RACKS

1. Normally, there is just as much or more rack surface as plating surface on the articles plated. Therefore, by insulating the rack, you use 50% as much current. This is accomplished because there is only half the cathode surface exposed to plate.

2. If 50% of the current is used to plate the same number of articles, by eliminating the cathode surface of the racks, there is also reduced, 50% of the metal consumption.

3. Elimination of the metal deposit on the racks does away with the problem of the so-called job of "stripping" them. This, in itself, requires a great deal of labor and time.

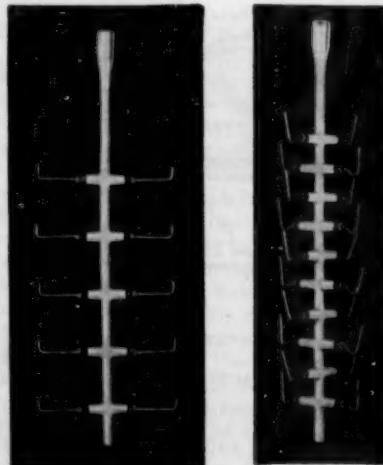
4. Racks that have to be stripped are "short lived." These racks, porcelain coated, and said to last definitely.

5. By cutting down the metal consumption to half, the solution is not subjected to such a drain of metal content. Therefore, more uniform plating results and "burning" does not occur so easily.

ADVANTAGES OF INTERCHANGEABLE TIPS

The benefits derived by the use of adjustable tips are as follows:

1. It allows a few basic racks to be used for almost all articles. Interchangeable hooks do away with a mass of



PORCELAIN ENAMELED RACKS WITH INTERCHANGEABLE TIPS

various kinds of racks designed for particular articles, which clutter up the plating room.

2. Much smaller cost for racks to perform the same amount of work. Only new tips are needed instead of a whole new rack for a new class of work.

The manufacturers will make special rack patterns to suit any requirements.

BELKE COMMUTATING RHEOSTATS

The Belke Manufacturing Company, 2952 W. Van Buren street, Chicago, Ill., is manufacturing a line of commutating rheostats for plating rooms. The rheostat has 100 amperes capacity. In order to get from 1 to 5 amperes in one ampere regulations turn the left cylinder clockwise. To get regula-



BELKE COMMUTATING RHEOSTAT
for the single amperage regulation.

tions from 5 to 10 amperes, turn it the opposite direction. To get from 10 to 20 amperes turn the right cylinder to take in the first chamber and repeat the manipulation of the left hand cylinder as above described. To get 20, 30, etc., to 100 amperes in one ampere regulations repeat the above process, moving the right cylinder to the proper position and then using the left cylinder

Chambers filled with nickel balls are used to transmit the current. They burnish the cylinder surface and keep it bright. This means that perfect contact always takes place and no dirt or corrosion interferes with the passage of electrical current.

It is stated that the rheostat is made with infinite care, of the best materials procurable. Hands, dripping with acid, may turn the handles and there are no exposed wires to be corroded. There are no knife switches to get out of order.

NEW LACQUER

A new lacquer is being marketed by the Greater Service Company, 331 Broad street, Newark, N. J.

The lacquer is said to be waterproof and is furnished transparent or in colors. The clear lacquer is used for protecting, preserving and beautifying the finishes of coated articles. The colored lacquer is used for decorative purposes, for producing polychrome effects, coloring glass and electric bulbs, etc.

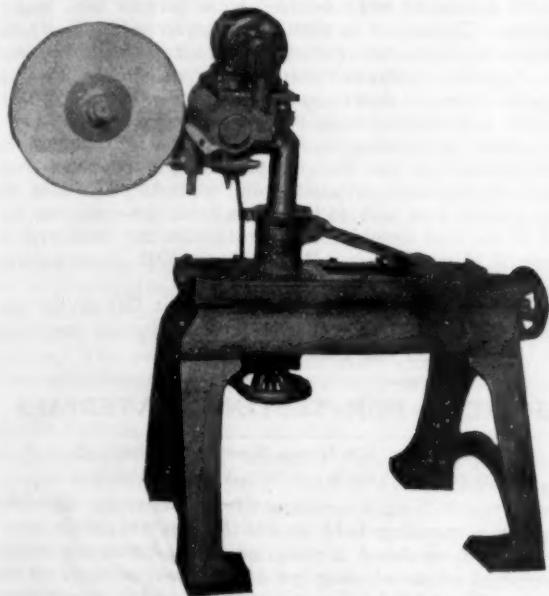
Small trial quantities of these lacquers are available before making substantial purchases.

TUBE BUFFING MACHINE

This machine was designed for buffing tubing of various sizes and lengths such as manufactured by plumbing goods firms, electrical fixtures, automobile robe rails, etc.

The principle of the machine is similar in operation to a centerless grinder. The work is passed between the feed roll and the buff wheel and is automatically fed through by the action of the feed roll, the angle on which this roll is set determining the speed that the work passes through.

This machine is used in conjunction with the regular standard polishing lathe and nothing special is required. The small motor mounted on top of the machine is for operation of the lighting circuit and drives the gears that revolve the feed roll, which in turn revolves the tube as it passes through.



ACME TYPE "F" TUBE BUFFING MACHINE

Adjustments are provided for taking up wear of wheel, center height and different sizes of tubing.

This machine is made by the Acme Manufacturing Company, 355 Howard street, Detroit, Mich.

REFINED GRANULATED NICKEL SALTS

The Middlesex Aniline Company, with factories at Lincoln, N. J., manufacturers of electro-plater's chemicals state that they are the original manufacturers of refined granulated nickel salts. Those nickel salts the Middlesex Aniline Company has for the last two years been selling exclusively to the Hanson & Van Winkle Company, together with metal cyanides which they also manufacture, but they are offering their product direct to the trade.

Dr. Wm. N. Kohlins, president of the Middlesex Aniline Company, invented a special process of refining nickel salts prior to crystallization, enabling him to produce a very fine pure crystal. On this process a patent has been applied for.

The purification of nickel salts is generally done by multiple re-crystallizations. The purity of the salt depending upon the number of re-crystallizations. The more times the nickel salts are re-crystallized the larger the crystals obtained. This accounts for the market judging the purity of nickel salts by the size of the crystal. The larger crystals were considered the purest.

The Middlesex Aniline Company claims its product to be purer than the larger crystals. The advantages of fine granulated pure salt in the electro-plating trade are chiefly, the rapid solubility in cold water and the possibility of replenishing the nickellic contents of the bath by just adding the salts directly into the bath.

The Middlesex Aniline Company in addition to manufacturing nickel salts and metal cyanides, also manufactures copper

carbonate. The company offers to the trade only products manufactured at its factory, and does not do jobbing business. The company has made arrangements with John J. Vay, Jr.,

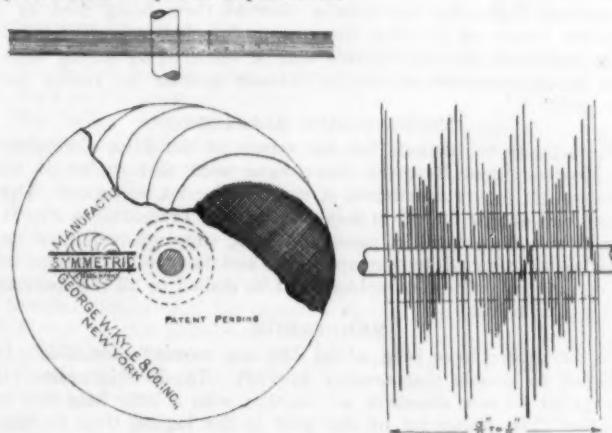


MIDDLESEX PREPARED NICKEL SALTS

formerly connected with Hanson & Van Winkle, and president of the John J. Vay Company of Cleveland, to take charge of sales and distribution of its products throughout the United States.

SYMMETRIC BUFFS

George W. Kyle & Company, Inc., have purchased outright the good will, patent rights, trade mark, machinery and equipment of the Eagle Buff Company, which will from now on be operated as a special department.

SYMMETRIC BUFF SECTION - EFFICIENCY OF OVER 60%
KYLE SYMMETRIC BUFFS

Symmetric buffs, made by the Kyle Company, are said to show a saving over ordinary buffs. It has a firm uniform face that holds composition; concentric to the last revolution; perfect balance; firm arbor hole. The claim is that it saves labor, material and composition.

NEW TRIPOLI COMPOUND

The Nulite Polish Company, 248-250 Plymouth street, Brooklyn, N. Y., is now making a Tripoli composition called Grade 4 "C". The company claims that this composition is superior on all classes of work demanding a speedy and economical cutting compound. This product is added to the many others which this concern manufactures.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

Headquarters, 140 S. Dearborn Street, Chicago, Ill.

1924 CONVENTION

Following due consideration of all factors entering into the question of season, the Board of Directors at a meeting on November 20th unanimously voted to return to the practice of holding Fall meetings, a custom departed from in 1921, when because of certain conditions it was decided to postpone the annual meeting of that year until the Spring of 1922.

PLACE OF MEETING

The Board were also unanimously in favor of meeting in some city west of Cleveland, as the only meeting held in that section since the Chicago Convention in 1914 was at Milwaukee in 1918.

SPECIAL COMMITTEE

The Board authorized appointment by the President of a special committee to investigate conditions in cities in the central west from whom invitations had been received. This committee will meet in January. In the meantime, information is being gathered in support of invitations received from Detroit, Indianapolis, Chicago and Milwaukee. If any member has good reasons for favoring any one of these cities, he is invited to file them with the Secretary for the information of the Committee.

BOUND VOLUME

Publication of bound volume of Transactions No. 31 covering the Cleveland Convention and all activities for the year 1923, will be rushed to completion immediately after the close of the fiscal year ending December 31st.

THE BULLETIN

The A. F. A. Bulletin, which has been published intermittently during the past two years, will be made a quarterly publication, the first number to be issued in January, 1924. In addition to progress and committee reports, the abstracting of articles and publications on foundry subjects will be featured not only for immediate reference, but with a view to their being filed as a valuable index on foundry literature. Supplementing the quarterly Bulletin a monthly service will be rendered by giving members an up-to-the-minute list of current articles by author and title only.

MOLDING SAND RESEARCH

In response to requests for the report of the Joint Committee on Molding Sand Research there have been sent copies of the mimeograph report distributed at the Cleveland Convention. This report will appear in full in bound volume of Transactions No. 31. It will also be printed in pamphlet form, supplemented by a detailed description of testing apparatus and later investigations of the committee. These pamphlets will be mailed to all members as soon as published.

MEMBERSHIP

To date there have been added 236 new members for 1923. It is hoped to double that number in 1924. To do this means an average of 48 new members per month; with a little help this is possible. The beginning of the year is the logical time to take out membership. Members will please note members from their districts in the Year Book. Then select some good non-member prospect and see that he gets the enclosed application blank. Tell him he will receive copy of Transactions No. 31 for the year 1923 if his application is received during January.

The officers of the Association express their sincere appreciation of the support of the members during the year just ending.

INSTITUTE OF METALS DIVISION

Headquarters, 29 W. 39th St., New York

The Institute of Metals Division, A. I. M. E., will continue during the current year to have two meetings, one with the A. I. M. E. in February, and the other one with the American Foundrymen's Association. This arrangement during the past years has been highly successful, for it furnishes our members with the opportunity to attend the technical sessions in February and in addition to view the exhibits of the American Foundrymen's As-

sociation either in the spring or fall. The outstanding event of interest in 1924 was the lecture by Dr. Walter Rosenhain, Superintendent of the Department of Metallurgy, of the National Physical Laboratory, Great Britain. Dr. Rosenhain, after delivering the lecture before the Institute of Metals Division, spent about two months in traveling around the country visiting various universities and delivering lectures before their student bodies and in addition lectures before various local sections of technical societies. The stimulating effect of this trip was very great, and many favorable comments were received from persons who heard Dr. Rosenhain. The lecture in 1924 will be given by Dr. Zay Jefferies, of Cleveland, Ohio. Dr. Jefferies does not need any introduction to an American audience interested in metallurgy. His many papers on various subjects have been of the highest order, and we expect a most interesting lecture from him.

The policy of inviting a foreign lecturer in alternate years will be carried out, so that in 1925, if it is possible to secure another distinguished scientist from abroad, plans will be so made. Universities and technical societies interested to be included in the tour should communicate with the Secretary of the Institute of Metals Division, W. M. Corse, 1901 Wyoming avenue, Washington, D. C.

The membership of the Division is about 900 at the present time and contains nearly all the leading non-ferrous metallurgists in the United States and some from abroad.

SOCIETY FOR TESTING MATERIALS

Headquarters, 1315 Spruce Street, Philadelphia, Pa.

CORROSION TESTS ON NON-FERROUS METALS

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, at a meeting held at the Society's headquarters on October 25, formulated a program of co-operative tests for the purpose of developing proper corrosion tests of these materials. Four kinds of tests will be made: Total Immersion, Alternate Immersion, Spray, and Accelerated Electrolytic Tests. Six metals and alloys (nickel, zinc, lead, copper, aluminum and admiralty metal) will be tested by each method, using the following six solutions: (1) Sodium chloride, (2) hydrochloric acid, (3) acetic acid, (4) sodium hydroxide, (5) ammonium hydroxide and (6) potassium dichromate. Test specimens will be 5 by 2.5 by 0.25 cm. in size, with a $\frac{1}{16}$ -in. hole drilled $\frac{1}{4}$ in. from the end of the specimen for suspension. For electrolytic tests the specimens will be 10 cm. long. All solutions will be made up exactly normal in Pyrex glass with freshly boiled distilled water and stored in Pyrex glass flasks and stoppered with rubber stoppers. All tests will be run at a temperature of 25° C. $\pm 1^{\circ}$ C. The material will be obtained in the form of sheets $6\frac{1}{2}$ in. wide by 36 in. long, and approximately 0.10 in. in thickness. All sheets will be rolled from the same or consecutive ingots, and careful record will be kept of the steps in the manufacture. Analyses and tests of the material will be made at the Bureau of Standards.

It is especially to be noted that these tests are not being made to determine the relative corrosion resistance of any one metal or of any group of metals, the purpose being to compare and evaluate the various types of corrosion testing.

COMMITTEE B-2 MEETING

Committee B-2 on Non-Ferrous Metals and Alloys held its regular fall meeting at the Society headquarters on Wednesday, October 24. Meetings of several sub-committees were held on the preceding day and on Wednesday morning, the meeting of the main committee being held in the afternoon. At this meeting reports were received from all sub-committees and from these reports the following notes of general interest are taken:

Sub-Committee II on Wrought Metals and Alloys reported that consideration was being given to the revision of Specifications for Admiralty Condenser Tubes presented at the last annual meeting, and that as new work it is considering specifications for Muntz metal condenser tubes and 70-30 brass condenser tubes.

Sub-Committee III on Sand-Cast Metals and Alloys reported progress in the study of a standard form of test bar, stating that fifteen laboratories are at present engaged in the investigation of the bar proposed in its last report. The sub-committee is also considering the matter of specifications for certain sand-cast alloys not as yet included in the committee's specifications.

Sub-Committee V on Plates, Tubes and Staybolts for Locomotives recommended, as the result of a series of tests on copper firebox plates and copper bars for staybolts, that the percentage of elongation for arsenical copper in the Standard Specifications for Copper Bars for Staybolts (B-12-21) be changed from 35 to 40 per cent. This recommendation was approved by the committee.

Sub-Committee VIII on Aluminum Alloys reported that revisions in the Specifications for Light Aluminum Casting Alloys (B 26-21) were being prepared for submission at the next meeting; also that specifications for sheet aluminum were being prepared based upon recent specifications of the Federal Specifications Board. It was suggested to the sub-committee that it should bring out in its annual report next year information regarding the high-strength aluminum alloys, since there is need by engineers and designers for reliable data on the properties of these alloys, notably the alloys of magnesium and silicon with aluminum. The subject of magnesium alloys was also discussed.

Sub-Committee IX on Nomenclature and Definitions reported it is preparing a questionnaire for distribution among national and international bodies to secure opinions regarding four possible bases of nomenclature of the non-ferrous metals and alloys. The sub-committee also made the suggestion that the List of Alloys, published a year ago in the committee's report, be supplemented by a statement showing the uses for which the various alloys are suitable.

Sub-Committee XII on Metallic Fluxes and Deoxidizers has under consideration such matters as specifications for phosphor tin, phosphor copper, silicon copper, etc. The importance of having a symposium or round table discussion on fluxes was emphasized by several speakers and the suggestion was advanced that such a discussion might be arranged in connection with the next meeting of the Institute of Metals.

AMERICAN ELECTRO-PLATERS' SOCIETY

Headquarters, care of F. J. Hanlon, 216 N. Jefferson St., Chicago, Ill.

The American Electro-platers' Society, with the ending of year 1923, will have completed another epoch-making year in its history, showing a large increase in activities, benefiting the profession. The convention that was held at Providence, R. I., was conclusive evidence that the members of this society are progressive platers who will give freely of time and money to obtain the knowledge necessary to keep them abreast of the times. The quantity and the quality of the papers read, discussed and debated at these sessions was further evidence of the interest maintained by members and their guests in the many new developments of the plating art brought forth by the Society members, and the Bureau of Standards at Washington, D. C., through Dr. Wm. Blum and his efficient assistants.

One of the many things that has been of great assistance to our members, has been the uniform manufacture of nickel salts, by the different plating supply companies. Another big item of interest will be the result of the Bureau of Standards' investigation of nickel anodes. The continued publishing of the Review with all these facts and discussions on them by the various Branches, causes members to look forward each month to the visit of the Review with more pleasure and added interest in the art.

It is hoped that in the year 1924 closer relations of the Branch Societies and the Research Committee of the Supreme Society, can be fostered, so that we can progress faster through their assistance to the Bureau of Standards. Many of the various things that now seem to be mysteries will then be solved.

It is also hoped that this year may see a greater interest displayed in the development of this industry by the manufacturer of plated goods, and also lending his assistance by impressing the minds of Committee on Appropriations at Washington, D. C.,

through his representative, with the necessity of a larger and more constant research in the plating art.

We have now reached a membership of 1,000 in the Society and this, coupled with the fact that from present outlook 1924 will be just a little better than 1923 from a business viewpoint, means that all feel hopeful and wish everybody a Happy New Year.

First call for the Educational Program for the 1924 convention to be held in Milwaukee, Wisconsin, June 30, July 1, 2 and 3.

The Committee in charge of the technical papers to be read and discussed at our next convention is desirous of receiving papers on electro-plating, or any other subject relating to the finishing of metals, etc.

The time for preparing education papers and features for the convention is at hand, and as the success of the convention depends largely on the educational program and features, we earnestly request all members and friends of our society to prepare the papers they wish to present at our next Convention as early as possible.

We earnestly request the branch secretaries to call attention to the members that this work should not be delayed, also would like the members to give us name and address of any one of our friends, who they know are in a position to prepare a technical or practical paper or any other subject that would be of interest to the electro-plater.

We shall expect to hear from you just as soon as you can furnish us with some definite information along this line. It is our desire that all papers shall be in the hands of the Committee by May 1, 1924.

Address all communications in regard to the educational program to Dan. Wittig, 375 3rd street, Milwaukee, Wis.

TECHNICAL PAPERS COMMITTEE,
Dan. Wittig,
A. E. Kienth.

NEW YORK BRANCH

Headquarters, care of J. E. Sterling, 468 Grand Ave., Long Island City, N.Y.

This branch is looking forward to the annual banquet which will be held February 23, 1924, at the Aldine Club, 200 Fifth avenue, New York City.

The committees with William Fischer chairman and C. E. Stiers, publicity and booklet chairman, are working hard. Expense is no object.

The afternoon session of Founders' Day will be conducted by C. H. Proctor, Founder of the Society. Various papers will be read and discussed.

The ladies' committee will entertain the ladies, while the members and their friends are at the session. An especially fine dinner has been arranged for, after which dancing will be the main feature.

Each year the entertainment of this branch becomes more popular; the growing attendance at the banquets and the interest shown at the sessions prove the strength of this branch.

Several hours will be devoted to plating and its kindred problems in the afternoon session; the rest of the time for a good time. Tickets are \$4 each and can be obtained from C. E. Stiers, 27 Ardsdale Terrace, East Orange, N. J.

ST. LOUIS BRANCH

Headquarters, care of H. H. Williams, 4156 Botanical Avenue

St. Louis Branch, A. E. S., has been holding regular meetings which have been well attended and very interesting.

The Annual Banquet will be held on January 19, 1924, at the American Annex. The Education Session will begin at 3:00 p. m. with Dr. Wm. Blum of Bureau of Standards as principal speaker. He will give review of work thus far conducted by them upon Nickel Deposition, illustrated with exhibits and experiments. A cordial invitation is given to manufacturers, superintendents and all interested to attend this session. While this is in session the ladies will be entertained at a theatre party.

Dinner will be served at 6:30 p. m. followed by entertainment and a short program. Dancing will start at 8:30 p. m.

E. J. Musick is chairman of Banquet Committee, with G. S. Robins presiding at afternoon session. Mrs. H. H. Williams is chairman of Ladies' Committee.

Personals

HARRY E. STARRETT

Harry E. Starrett, who has been connected with the Hanson & Van Winkle Co., for 34 years, has recently given up active management of the Company's Chicago Branch, although still retaining a stock interest and a very close relationship with that company's affairs.

Mr. Starrett began his duties with the company in 1890 as sales representative and expert in the western field with headquarters at the Chicago office.

In 1912 the office of Western Sales Manager was created and Mr. Starrett was appointed to fill that position. A few years later he was appointed Sales Agent of the western territory which position he has held up to the time he decided to give up active service.

Mr. Starrett is not only one of the oldest but is undoubtedly one of the best and most favorably known men in the electro-plating trade. His cheerful and congenial personality has won for him a host of friends both in and out of business. This friendship, he hopes that H. C. Stewart, who has taken up the duties relinquished by him, will be fortunate enough to retain.

L. J. Buck, United States sales representative of British America Nickel Corporation, Ltd., announces the removal to more adequate offices at 9 East 46th street, New York City.

C. A. Smith has been transferred to the Pittsburgh office of the New Jersey Zinc Sales Company, having formerly been in the Cleveland district office. Before going to Cleveland, Mr. Smith had been in the New York office.

Francis R. Pyne has accepted a position as assistant general superintendent for the Nichols Copper Company, Laurel Hill, N. Y. He was formerly works superintendent for the U. S. Metals Refining Company, Carteret, N. J.

Dr. E. H. Darby, formerly assistant professor of chemistry at Union College and research chemist for the General Electric Company, Schenectady, N. Y., is now research engineer in charge of research, development and tests, Rome Wire Company, Rome, N. Y.

Junius D. Edwards spoke on "Aluminum Bronze Pigments" at a meeting of the Detroit Paint and Varnish Production Men's Club on November 13th. Mr. Edwards is assistant director of research of the Aluminum Company of America, Pittsburgh, Pa.

Royal F. Clark, who has for the past three years had charge of the electroplating department of E. Poeter & Company, Irvington, N. J., has accepted a position with the Musante Plating Corporation, New York City, as foreman of the gold and silver electroplating departments.

J. S. Vanick has resigned as research metallurgist for the government fixed nitrogen research laboratory and as liaison officer for sections of the War Department at the Bureau of Standards to accept a position as research metallurgist in the new research and development department of the International Nickel Company, Bayonne, N. J.

G. Bluemel has joined Tate-Jones & Company, Inc., furnace engineers and builders, and will manage the New York sales district covering New York, New Jersey and New England, with headquarters at 50 Church street, N. Y. Mr. Bluemel was previously associated with the Ferguson Furnace Company for eight years as chief engineer and vice-president.

B. B. Hood, formerly assistant works superintendent of the U. S. Metals Refining Company is now works engineer at the Western Electric Company's new plant which is being built at Kearny, N. J. Temporarily, shops in leased quarters are being occupied in Newark and Jersey City, during the construction of the new plant.

Clinton G. Armstrong has become associated with the Calorizing Company, Pittsburgh, Pa., in the capacity of sales



HARRY E.
STARRETT

engineer and will be connected with that company at the Chicago office. Mr. Armstrong was formerly consulting metallurgist for the Chicago Flexible Shaft Company, and research metallurgist of the Western Electric Company.

The Hilo Varnish Corporation, Brooklyn, N. Y., recently added to its western sales force, **C. L. Nagel**, who will make his headquarters at the Chicago branch, 2420 Washbourne avenue. Mr. Nagel is a technically trained man, who has specialized in the paint and varnish field. He will call upon the furniture and metal working industries in the interest of Hilo enamels and japans.

F. S. Auty has been appointed advertising manager of Drying Systems, Inc., 11 South Desplaines street, Chicago, Ill., manufacturer of equipment for baking enamels and japans and for the drying of paint and varnishes on manufactured metal products. Mr. Auty was formerly managing editor of Chatter, the monthly publication of the Machinery Club of Chicago.

J. F. Newman has become president of the Lawrenceville Bronze Company, Pittsburgh, Pa., succeeding the late John F. Robertson. Mr. Newman was purchasing agent of the Weirton Steel Company, Weirton, W. Va., for twelve years. The Lawrenceville company manufactures copper and bronze castings, specializing in blast furnace tuyeres, coolers, bosh plates, valve seats and rolling mill bearings.

A. L. Haasis advises his friends as follows: "I don't know what to wish you for the New Year. You have a wife, and you have a foundry, and you use Dixon's crucibles, and you also have an automobile and a radio—so there is really nothing left to wish you but another foundry and another automobile. A bully good Christmas and believe me yours always 100 per cent."

J. G. Pearce, a member of the laboratory staff of Metropolitan Vickers Limited, Manchester, England, has been appointed director of research in succession to Dr. Percy Longmuir who lately resigned. Mr. Pearce is 33 years of age, and is a member of the Institute of Metals, as well as of the Institute of Electrical Engineers. He has rendered good service on the Council of the Non-Ferrous Research Association. He was trained at Birmingham University and for many years has been on the Metro-Vickers staff, making a special study of non-ferrous metals and electrical work.

A. W. Bergman and **W. Bergman**, formerly connected with the Gorham Manufacturing Company, Providence, R. I., now are directors on the board of the Auburn Brass Foundry, Auburn, R. I. The company specializes in the production of high grade tablets, figures and architectural metal castings.

While motoring to Philadelphia **Wilfred S. McKeon**, president of the W. A. Fuller Company, Greensburg, Pa., met with an accident. His car skidded over a bank, turning over twice; his escape from death was miraculous. Mr. McKeon is recovering from a broken leg at the Chambersburg Hospital, Chambersburg, Pa.

Deaths

CHARLES S. PLATT

Charles S. Platt, for many years a prominent refiner in New York, and grandson of one of the first refiners in the United States, died at his home, 16 W. 40th St.

Mr. Platt was a New Yorker, born on December, 1846. He attended the Columbia School of Mines and later went abroad to study mineralogy and chemistry. In 1868 he became associated with his grandfather, George W. Platt, one of the first refiners in the United States.

The business was originally started by George W. Platt and Nathan Platt under the style of Platt & Brother. The firm was one of the largest jewelry, novelty and watch houses in the country. The concern also operated the only large gold

and silver refining plant in the United States, doing the work for all of the jewelers and silversmiths.

Upon the death of Mr. Platt's grandfather in 1881 he took over the business and continued under his own name. At that time the office and salesrooms were located at 4 and 6 Liberty place while the refinery was at 69 Thomas street. In 1890 he built the building at 29-31 Gold street, where the business was located and is still being continued by his successors.

After continuing until 1905, Mr. Platt disposed of his business to Handy & Harman. He continued, however, as a director in the firm until 1915 when he finally retired.

Mr. Platt was married in 1887 but suffered the loss of his wife about 12 years ago. He is survived by two sisters and one brother.

GILMAN C. HILL

Gilman C. Hill, 80 years of age, died suddenly at his home, 96 Hillside avenue, Waterbury, Conn., December 6th. He had played a leading part in the building up of Waterbury's brass industries. He was born in Bethlehem, June 13, 1843, and settled in Waterbury in 1862. In 1871 he became secretary of the American Flask and Cap Company and held that position until 1876 when the concern was absorbed by the Waterbury Brass Company. He then became manager of the Waterbury Brass branch of the American Brass Company and continued in that position until January 1, 1915, when he retired.

He was also a director of the Dime Savings Bank and the Waterbury National Bank. He married Miss C. Buckingham Benedict in 1878 and had one daughter, Katherine, who was married to Dr. Newson Pomeroy in 1904. Mrs. Hill died in 1914 and his only surviving relative is Mrs. Pomeroy.—W. R. B.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

JANUARY 7, 1924.

SCOVILL-AMERICAN PIN-OAKVILLE PURCHASE

The last month of the year has seen many changes in the brass companies of Waterbury and vicinity. A merger, in size and importance the greatest in years in this city, second only to the **Anaconda-American Brass** two years ago, was effected in a few weeks. The **Scovill Manufacturing Company**, which vie with the **Chase Companies** as being the greatest manufacturer of brass in the world next to the American Brass Company, has taken over in its entirety the two chief pin manufacturing companies of the company; the **American Pin Company** of Waterville and the **Oakville Company** of Oakville, both suburbs of Waterbury.

The plan for acquisition was announced by the officials of all three companies shortly after December 1. The first plan was for the Scovill company to acquire 67 per cent of the capital stock of both companies. The Scovill company was to give one share of Scovill stock for four shares of American Pin company stock, and two and one-quarter shares of Scovill stock and \$50 of debenture notes for one share of Oakville stock.

This plan was approved by the directors of both companies and a date set for meetings of the stockholders of the three companies to act on the merger. Before the meeting took place, however, a new plan was proposed whereby the Scovill company was to purchase outright the properties, assets, franchises and good will of the two pin companies.

This plan was approved by the Scovill stockholders on December 24, by the Oakville stockholders on the 26th and by the American Pin Company stockholders on the 28th. Final papers perfecting the transfer were signed on the latter date. Both pin companies will be operated as before under the same management, being known respectively as the "Scovill Manufacturing Company, American Pin Company

THOMAS NELSON

Thomas Nelson, 54 years of age, died in St. Petersburg, Fla., November 18th. After working 30 years in various cities in Scotland (where he learned the molder's trade) Mr. Nelson emigrated to Toronto, Ontario, Canada, in 1911, and was placed in charge of the ornamental iron department of the Canada Foundry Company, now the Canadian Allis-Chalmers Company. Later, he assumed charge of the iron, brass and bronze foundry of the same company's new plant. Mr. Nelson was badly gassed with brass fumes during the close of 1914, and as a result of this coupled with strain caused by war conditions, he collapsed in 1919, and upon medical advice moved to Florida.

THEODORE W. CRAMP

Theodore W. Cramp, grandson of the founder of the Wm. Cramp & Sons Ship & Engine Building Company, died at his home in Philadelphia recently. He was 64 years of age. In early life he was treasurer of the above mentioned company, but latter entered the brokerage business.

WILLIAM HOOPES

As we go to press word comes of the death of William Hoopes of Pittsburgh, Pa., chief engineer of the Aluminum Company of America. A more extended report will be published in our next issue.

HENRY P. SIEGEL

Henry P. Siegel, president of Lasalco, Inc., St. Louis, Mo., died on December 8, 1923.

branch," and "Scovill Manufacturing Company, Oakville Company branch."

The Scovill Company stockholders have also approved an additional issue of stock of the Scovill company not to exceed 27,000 shares of par value of \$100 each and coupon debentures, registrable as to principal only, not to exceed \$300,000. This stock and debenture notes will be used, in whole or in part, to pay for the properties, assets, franchises and good will of the two pin companies.

The Scovill Manufacturing Company is now capitalized at \$15,000,000. Its stock was increased to the present amount from \$5,000,000 just a year ago by the declaration of a 200 per cent stock dividend to all holders of the stock then outstanding. Dividends during the year have increased rather than diminished in spite of the declaration of a stock dividend. It paid \$2 per share in April, \$4 a share in July, \$6 a share in October and just prior to the merger, declared another dividend of \$6 a share, payable January 5th. The officers are: President, Edward O. Goss; vice-president, John H. Goss; secretary, Leavenworth P. Sperry; assistant secretary, Thomas Myers; treasurer, Clayton M. DeMott, and assistant treasurer, Frank J. Gorse.

The American Pin Company is now capitalized at \$1,350,000, having been increased from \$50,000 to \$100,000 in 1850 and to its present amount about 10 years ago. There are 54,000 shares of par value of \$25 each. It was founded in 1843. Members of the Bronson, Benedict, Burnham, Booth, Elton and Driggs families have figured largely in its history.

The perfection of the pin-sticking machine was no small factor in the growth of the business. The "goose-neck" or "slide" features perfected by the **Slocum & Jillson Company**, became the absolute property of the American Pin company. The "crimper" feature, which was perfected by Dr. Howe, of Bellevue Hospital, was used by special agreement with the inventor who also used it in his own concern. T. L. Driggs became treasurer of the concern in 1865, secretary and treasurer in 1866 and president and treasurer in 1868, at which time his son, George Driggs succeeded him as secretary. Follow-

ing the death of T. I. Driggs in 1893, A. M. Blakeslee served as president until his death in 1908 when George Driggs became president and treasurer. Following the death of George Driggs in 1919, his son, T. I. Driggs, 2nd, who had been made assistant treasurer in 1914, and general manager and assistant treasurer in 1916, succeeded him as president and treasurer. He now holds both offices. W. W. Bowers is secretary, F. E. Bartlett, vice-president, and H. B. Jenkins, assistant secretary. The directors at present are G. W. Burnham, John P. Elton, H. B. Jenkins, T. I. Driggs, Harris Whittemore, F. E. Bartlett and W. W. Bowers. The plant covers 32 acres and employs 1,050 persons. It manufactures pins, safety pins, hooks and eyes, plumbers' brass specialties, electric fixture parts and brass bedstead trimmings.

The Oakville company was established in 1852, with Greene Kendrick and Elisha Leavenworth in control. The company moved along slowly until the late J. Hobart Bronson, who died in 1921, became secretary and manager in 1877. From then on, under his management the company's business advanced by leaps and bounds until it became one of the greatest pin manufacturing concerns in the United States. It employs about 900 hands and manufactures wire and metal goods in addition to pins. Throughout its history his stock has remained under the control of the heirs of the original owners but never under the control of one family. Bennet Bronson, son of the late J. Hobart Bronson, is the president and treasurer of the company. George Boden is vice-president and general manager and Charles F. Doherty is secretary. While the American Pin Company shares the distinction of being the country's foremost manufacturer of the "straight pin" or toilet pin, the Oakville company is the foremost manufacturer of the safety pin. The Oakville company is now capitalized at \$600,000, divided into 6,000 shares of par value of \$100 each.

E. O. Goss, president of the Scovill company, stated that the purpose of the proposed rearrangement is to bring about a better co-ordination between the concerns involved to strengthen their operating conditions. He said that the existing facilities of the concerns were ample to handle much more business than was being handled at the present time. He also stated that the existing facilities of the concerns were ample to permit the employment of much more labor. The rearrangement, he felt, should bring much more business to Waterbury. The administration of the two pin companies would continue in the hands of those who now administer the affairs, he said.

CHASE-NOERA REORGANIZATION

The Chase companies have taken over active management of the **Noera Manufacturing Company**, of which they have held the controlling stock interest for some time. It is situated just north of the Chase Rolling Mill. "Mr. Noera, president of the company," Chase officials stated, "felt that at his age he could properly take a well-deserved and long deferred trip to his native land, Italy, and has given up active management of the concern, the stock of which is now held by the Chase companies. At a recent election of officers of the Noera company, held just prior to Mr. Noera's sailing, the following were elected: **F. S. Chase**, president; **Frank P. Noera**, vice-president; **Richard D. Ely**, treasurer, and **Benjamin Spock**, secretary. There are no special changes contemplated in the management of the company. It expects to continue its work as heretofore, if anything, on a larger rather than on a smaller scale."

R. D. Ely is also assistant treasurer of the Chase companies, and general manager of the Chase Metal works and the Chase Rolling Mills. B. I. Spock is secretary of the Chase Companies and secretary of the H. S. Chase company. Prior to the recent election of officers of the Noera company, Frank P. Noera was president and treasurer and Charles E. Weber was secretary. The company was incorporated in 1905 although it had been in business as the Noera company for many years. The capital stock is \$75,000. The concern employs from 250 to 300 hands and makes brass hardware specialties such as bicycle and automobile sundries and particularly oil cans and automobile pumps. New factory buildings were erected in 1911 and in 1912 and larger brick buildings in 1915 and 1916.

The **New Haven Copper Company** of Seymour has been sold, according to the officials in charge, but they decline to name the purchasers. It is understood, however, that the

new owners are Waterbury men who are interested in brass factories here. Attorney John H. Lancaster of Litchfield, managing director of the company states there has been a complete change in the stock ownership of the company and that there will be some further changes in the management shortly, but declines to name the new owners. The company will continue to operate on the same scale as at present or on a more extended scale. He will continue for the present as managing director and **Walter James** will remain in charge of production. Prior to the change in ownership, the James and Camp families of Seymour controlled the company for several generations.

The company manufactures braziers and sheathing copper. The process adopted by the company for finishing their polished copper is a special invention held by the company. By its means, the gloss remains permanent whereas by the old method it was likely to become tarnished in a short time. Thomas James patented the process. The stock is \$200,000 and the officers until recently were: Thomas L. James, president; Henry J. Richards, secretary and treasurer, and G. Walter James, superintendent. The death of Thomas James and Henry Richards, the latter, general manager of the mill, is said to be one cause of the sale.—W. R. B.

BRIDGEPORT, CONN.

JANUARY 7, 1924.

Settlement of the War Department's claims against the **Bridgeport Brass Company**, arising over payments on war contracts has been reached through the refunding to the government by the company of \$400,000 by Attorney-General Daugherty, it was announced last month. Officials of the War Department made the claim some eighteen months ago that an overcharge of about \$700,000 had been made to the brass company. At that time Attorney-General Daugherty included the Bridgeport company claim in a report to President Harding and Congress, alleging a large number of "war frauds" against the Government by concerns which had executed Government contracts during the war.

This report was made at the time when charges were being made that the Justice Department was permitting a number of persons to get away who had defrauded the Government on war contracts. In direct answer apparently to these charges, Attorney General Daugherty sent a report to Congress stating that legal steps were being taken to recover on a large number of war contracts. The report named the Bridgeport Brass Company and a number of other large concerns which had contracts with the Government during the war. Following a conference between Henry L. Stimson, former secretary of war and acting as attorney for the Brass Company and officials of the War Department, the company laid its books open to accountants of the War and Justice Department. Almost a year of auditing and negotiations followed.

Attorney-General Daugherty, in a statement issued last month, declared that it had been discovered that through the number of errors made, some of them through errors in construction of the law, and others in accounting, the company had been overpaid about \$400,000, which amount had been repaid to the Government under the settlement agreement.

John C. Stanley, president and general manager of the **American and British Manufacturing Company**, for a number of years and more recently one of the ancillary receivers under an order of the United States Federal court, has been named trustee of the bankrupt estate of that concern by Referee John Keogh.

Thomas C. Perkins, chairman of the stockholders' protective committee of the **Habirshaw Electric Company** of which the **Electric Cable Company** of this city is a subsidiary, who recently fought a reorganization proposal and whose opposition was sustained by the court, has mailed a circular to stockholders and creditors outlining the new plans for the organization. He says that the next step for every bondholder who deposited with any of the committees is to demand a return of his bond. Creditors who assigned claims should repudiate their assignments and demand a return of the papers. The letter further shows net sales of \$5,822,835 for the first nine months of 1923 and net profits of \$620,888 after all expenses are met.—W. R. B.

TORRINGTON, CONN.

JANUARY 7, 1924.

Building permits granted by the city superintendent of buildings during December included one to the Torrington Building Company for an addition 163 x 181 feet to the plant of the **Progressive Manufacturing Company**, at a cost of \$15,000. Another was to the **Turner & Seymour Manufacturing Company** for an addition to the core room. To **Frank W. Fuller** was granted permits for erection of storage sheds at the **Standard** and **Excelsior** plants of the Torrington company.

On December 13 the corporators and staff of the Charlotte Hungerford hospital gave a testimonial dinner to **Uri T. Hungerford**, founder of the hospital. It was on the eve of his birthday, Mr. Hungerford having been born in Torrington on December 14, 1841. Mr. Hungerford was unable to attend but a telegram was sent to him at the Ritz-Carlton, Atlantic City, where he was recuperating from an illness.

Three of Mr. Hungerford's associates from New York were present—**J. R. Van Brunt**, **Bernard Ris** and **C. H. Krueger**. The speakers were Dr. W. C. Rappleye of Yale, Dr. Elias Pratt, F. L. Braman, the Rev. W. A. Gildea and the Rev. W. C. Judd. The dinner was at Conley Inn.

The big new addition to the **Union Hardware** plant has been completed and is now in use.

The **Torrington Manufacturing Company** has filed notice of increase in capital stock to \$500,000. A total of 18,899 shares at a par value of \$25 is added to the previous stock issue.—J. H. T.

NEW BRITAIN, CONN.

JANUARY 7, 1924.

Although the metal manufacturing industry in this city has fallen off to a slight extent, New Britain at this time probably is the busiest manufacturing city in Hartford county if not in the state, according to Secretary **Arthur L. Brown** of the **Hartford County Manufacturers' Association**. One noticeable feature in connection with the decline is the fact that there has been very little labor turnover here, recently. The reason is that men with steady jobs are holding them and there is no demand for unskilled labor. There have been some slight layoffs in a number of factories, but it is the unskilled help in most cases that is affected.

No hardships, worked by bad labor conditions, are expected here this Winter. "Certainly there will be nothing like the conditions of 1920," Mr. Brown states. With the men now on the payrolls, virtually every concern is operating on a full time schedule and certain departments are running overtime, although only skilled workmen are used in such operations.

The year 1923 just closed, which opened none too auspiciously as a successful manufacturing year, developed early in the year into a fair market and as the months sped by business picked up until in mid-summer the local concerns were doing a fine business. Nor did this fall off as Fall and Winter came and the coming of the New Year finds practically every metal manufacturing concern on a good substantial basis, with a goodly amount of orders and prospects for more very bright. That the year also was good as a money maker is evidenced by the continuation of the regular dividends in all cases and the issuance of extras in a number of instances. Thus, on the threshold of another twelve months a summary of opinions gleaned from the heads of the factories is that "the business outlook for 1924 is bright."

Charles F. Smith, head of the board of directors of **Landers, Frary & Clark**, thanks the protective tariff for the good business of the past year and adds, "If the present policy of protection for the American working man is continued, good business will undoubtedly follow the election. New Britain industries are in a favorable position to take advantage of whatever prosperity the country affords."

George T. Kimball, vice-president of the **American Hardware Corporation** says: "We think business will be good for the first six months of 1924 and that there will be steady employment for those who desire work. Some prompt action

in regard to Secretary Mellon's proposal for tax rate reduction will be beneficial because it will encourage investments in other than tax free enterprises."

At the **Stanley Works**, **Russell & Erwin**, the **Corbin Screw Corporation**, **North and Judd Manufacturing Company** and other concerns similar outlooks of optimism were given.

Encouraging indeed are conditions at the **New Britain Machine Company**, a couple of years ago almost defunct. This concern, under new management, has taken a new lease of life and today is really a bustling industry, with a day and night shift working in some of its branches. The concern is limiting its production to machines which it is at the present time fully equipped to produce and is finding ample business. At the present time, it is understood, it is engaged upon a big order which runs close to the million dollar mark.

Over at the **Bristol Brass Company** conditions are not as bright as in other places, due to the brass market condition, and the set back which the company received at the end of the war. However, without in the least taking from the authority of President **A. F. Rockwell**, the directors have made some changes in management which it is expected will prove beneficial. Also, it was voted to pay the regular dividend on preferred stock, taking the money from that on hand. No dividend on the common stock has been paid in several years.—H. R. J.

PROVIDENCE, R. I.

JANUARY 7, 1924.

The year 1923 closed with the various metal trade lines showing a constant and consistent improvement over the first six months of the year and giving indications that there will be a continuance of this condition during the first six months of 1924, at least. In the building lines the past year boomed and extended to the metal lines while manufacturing jewelers and the co-ordinated industries in this city and the Attleboros, as a whole, have enjoyed a prosperous year. Gold lines have not done so well as the brass and cheaper lines in proportion, but the novelty makers in general have had a steady trade throughout the twelve months with excellent prospects ahead.

"Even though there is a note of pessimism in the industrial outlook of the State," says **George H. Webb**, Labor Commissioner of Rhode Island, after a survey made by his department; there is nevertheless a decided feeling of hopefulness that a reduction in taxes as proposed by the Federal Government during the year will tend to stabilize business and improve the general trend."

The survey on which Commissioner Webb bases these findings, was made by sending questionnaires to more than 200 manufacturing establishments representing all industries throughout Rhode Island. A summary of these returns is contained in the commissioner's statement. He says: Machinery, tools, jewelry and wire goods expect good business during 1924, while the outlook in the building trades is good, with a scarcity of help.

At the annual meeting of the stockholders of the **Rhode Island Hospital Trust Company** early in the month **Henry D. Sharpe**, treasurer of the **Brown & Sharpe Manufacturing Company**; **Alfred K. Potter**, vice-president of the **Gorham Manufacturing Company** and **Frederick A. Ballou**, of **B. A. Ballou & Co., Inc.**, were elected members of the Board of Directors.

Eugene Doucette, who for the past twenty-seven years has had charge of the coloring department of **Harvey Clap & Company**, Attleboro, resigned his position with that concern the first of last month. As a parting remembrance he was presented a purse of gold by his business associates.

Alsfeld Electro-plating Company has been increasing the facilities of its plant at 31 Mathewson street.

Hamilton & Hamilton, Jr., manufacturing jewelers, 7 Eddy street, have nearly completed their new factory building on Georgia avenue and have been granted permission to erect a large garage of steel and concrete on the premises.

Williamson's Patent Electric Hardware Company, of Providence, capitalized at \$75,000 for the purpose of dealing in and manufacturing electrical hardware and appliances has been

granted a charter under the laws of Rhode Island. The incorporators are Leroy A. Williamson of Allendale, R. I.; C. R. Lindley of Manton, R. I., and C. J. Hunter of North Providence.

The electro-plating establishment of John P. Bennett & Son, which has been located in North Attleboro for more than fifty years, has been sold to O. C. Hillman & Co., of Attleboro. The concern was established by the late John P. Bennett, who was the first colorer to introduce the coloring of jewelry by dynamo in the Attleboros. Frank P. Bennett, who has conducted the business since the death of his father, will continue the branch plant of the concern in this city.—W. H. M.

ROCHESTER, N. Y.

JANUARY 7, 1924.

The year of 1923 is closing with the larger percentage of Rochester industries in a state of healthful activity. This condition applies to business conditions in general in the manufacturing line, but more especially to those concerns employing non-ferrous metals. While the metal-using industries throughout the country have shown considerable irregularity as to activity at various periods this year, Rochester manufacturers are almost unanimous in declaring that 1923 has been unusually generous in their direction. There have been no really slack seasons in Rochester, but business caution has prevailed all year, with the net result that production has kept on a fairly even basis from month to month.

Unexpected prosperity was enjoyed by the stamping and can companies in Rochester. The General Electric Company and Bausch & Lomb Company have exceeded expectations. Stocks in all the big manufacturing plants are low, owing to market conditions throughout the country. Purchasing agents have ordered very closely all year, but it is believed that with the advent of spring in 1924 buying of metal supplies will be begun in a more generous quantity.

The Art Metal Construction Company of Jamestown has obtained the contract for furnishing the metal furniture and furnishings for the Cayuga county court house at Auburn.—G. B. E.

PHILADELPHIA, PA.

JANUARY 7, 1924.

Considered in their entirety, the non-ferrous metal trades in the Philadelphia district have not fully recovered from the seasonal dullness. Buyers are apparently pursuing a policy of conservativeness in purchases. All lines are receiving inquiries, but few are resulting in actual immediate business. Despite this quietness, foundries are assuming a more optimistic view of the future.

One of the largest contracts in the bronze line to be awarded in recent months has been let to the William Cramp & Sons Ship and Engine Building Company by the Oxweld-Acetylene Company, for 230,000 pounds of manganese bronze welding rods to be used in the oxy-acetylene process of high fire brazing of malleable iron, brass and bronze castings. In addition, the company has been awarded a contract by the Shipping Board for the manufacture of manganese bronze propeller blades aggregating 500,000 pounds, constituting the requirements of the government merchant fleet for six months. These contracts are probably the brightest spots in the bronze trade here.

Brass: Trade is virtually dormant, but this condition is attributed to stock adjustments and is considered merely temporary. Purchases are small and only for immediate requirements.

Aluminum: Trade is abnormally low but normalcy is expected to manifest itself in the next month when large orders probably will be placed by automobile manufacturers for bodies and other parts.

Nickel platers report business to be in an excellent condition. There is a marked improvement in plating electrical fixtures. The general objects for plating are being offered in increasing quantities. How long this condition will prevail however, is problematical. Silverplaters, specializing in

plating tableware and jewelry say trade is fair, as good as might be expected after the rush of the Christmas season. There are no large orders in sight.—A. F. C.

TRENTON, N. J.

JANUARY 7, 1924.

Conditions in the metal industry in Trenton are reported as being more favorable than during the Fall months and business is much better at all the plants. The J. L. Mott Company is busy again after a dull season and an addition to the foundry will shortly be erected. Conditions are also improved in the brass department. The cabinet shop has been closed, the company finding it more profitable to purchase cabinet articles than to manufacture.

Actual dissolution of the factory of the Ingersoll-Trenton Watch Company, Trenton, N. J., was begun recently with the sale of all the plant's tools and equipment. The purchase was made by A. H. and M. D. Sandler, tool dealers. The deal was transacted with the Waterbury Watch Company, of Waterbury, Conn., which took over the Ingersoll factory. The plant itself has not yet been disposed of.

National Lamp Company, Incorporated, of West New York, N. J., has been incorporated at Trenton with \$25,000 capital to manufacture electric lamps. The papers were filed by Mitchell Cahn, of West New York.

George T. Newell, Jr., Inc., to manufacture and deal in electrical appliances has been incorporated at Trenton with \$125,000 capital.

Marino Auto Radiator and Metal Works, Inc., of Plainfield, N. J., has been chartered at Trenton with \$25,000 capital to deal in automobile supplies.

Armor Bronze Corporation of New Jersey has been incorporated at Trenton with \$45,000 capital to manufacture and deal in bronze household goods and metal wares. The incorporators are Sig. C. Landsberg, South avenue, Garwood, N. J.; Louis Sternberg, 1421 Franklin avenue, New York, and Conrad Osterman, of 42 Northern avenue, New York City.—C. A. L.

DETROIT, MICH.

JANUARY 7, 1924.

The brass, copper and aluminum industry in Detroit closes 1923 under most favorable circumstances. The outlook for 1924 is excellent and without doubt will be the best in the history of the industry. Business has been steady all through the year. Every plant has operated continuously.

Heavy building operations over the country have made a strong demand for plumbers' supplies and building hardware. The automobile industry, as in former years, has heavily taxed manufacturers in every line. Practically every brass concern in the city does more or less automobile work no matter what its other output may be.

Manufacturers all over the city are most optimistic for 1924. Many are expanding and planning for the heaviest business in their history.

The labor situation has been excellent and 1924 starts with most cordial relations between employer and workman. At present Detroit has a surplus of unskilled labor but skilled men still are in much demand.

Construction work for the foundry building of the Unique Brass Company has been let.

A contract has been let to Albert A. Albrecht Company by the Cadillac Motor Company, for the construction of a brass foundry and core room at Clark and Scotten avenues.

The Capitol Brass Works have contracted for a new four-story building adjoining the company's present plant at Chene and Franklin streets. The building will be of brick and concrete with heavy factory construction.

The Detroit Brass & Malleable Works recently declared its monthly dividend of one-half of one per cent, payable to stock of record of November 26. The C. M. Hall Lamp Company, also has declared a dividend of five per cent, payable to stock of record of December 8. This makes a total of 20 per cent in dividends declared in 1923.

The Ornamental Bronze Company has been organized at Big Rapids, Mich., and will occupy part of the Binney Machine

Company's plant for the purpose of manufacturing bronze tablets, window designs, name plates, architectural bronze, statuary, and bronze and aluminum novelties. The new company is headed by E. R. and E. F. Deaday.

The **Bennett Injector Company** has been incorporated at Muskegon, Mich., for the purpose of engaging in the manufacture of oil, air and water injectors and pumps. It also plans to manufacture auto accessories. The incorporators are Frank Holt, George L. LeFevre and Walter H. Koelbel. The capital stock is placed at \$100,000.

The steel contract for the new foundry and warehouse of the **Great Western Smelting & Refining Company** has been let.

It is announced that the **Chatfield Foundry Company** at Escanaba, Mich., has purchased the **Nau Brass Foundry** at Manistique, the equipment of which will be moved to the Chatfield plant. Mr. Nau, it is said, still retains his interest in the business.

The **Metallurgical Products Company** has been incorporated at Jackson, Mich., with a capital stock of \$1,000. The principal stockholders are Fred M. Caldwell, 240 W. Main street, Jackson, Mich.; Clyde J. Holmes, and Walter D. Kline, Detroit.

It is announced that the **B-Metal Refining Company** has been incorporated in Detroit for \$25,000. The stockholders are Harold D. Stroud, 1935 Hazelwood avenue, Fred G. White and Clara C. Gaertner, Detroit.—F. J. H.

PITTSBURGH, PA.

JANUARY 7, 1924.

A large volume of business, in the metal industry, during the first quarter of 1924, as compared with the last quarter of 1923, is being looked forward to. Leading executives of the principal producing properties are of the opinion that tonnage which will be forthcoming next quarter will show a substantial increase.

C. W. Chatham of Pittsburgh, manager of the **Eagle-Picher Lead Company**, in an address this month before the American Society of Mechanical Engineers in the William Penn Hotel, Pittsburgh, Pa., said: "There is only 15 years' supply of lead and zinc in the world as far as is known and when this is exhausted paint and storage batteries and other articles made from these minerals will be vitally affected."

Mr. Chatham has been making a study of these metals for some time. He said that in a short time the visible supply of lead and zinc will become semi-precious, along with gold and silver. This is resulting from the tremendous use to which these metals are being put, especially in the construction of storage batteries, in which zinc and lead are both used, but mostly lead, and in paints, of which lead is the chief component, he said. The glass and rubber industries, he said, also use great quantities of lead.

Type Manufacturers report an active business. Printers throughout the city are ordering substantial quantities of nearly every style type. The outlook for next year's business is bright. Prices are unchanged and there appears little prospect for fluctuations in the coming year, as present levels have been maintained for a long period.—H. W. R.

CHICAGO, ILL.

JANUARY 7, 1924.

Good business at least through the first half of 1924 is predicted by executives of metal companies in Chicago. Some of the managers are particularly optimistic and foresee a big business throughout the year in spite of the oncoming presidential campaign.

The lead business is declared to be especially good at this time, despite the fact that trade in general has not yet a good new start following the Christmas holidays and the beginning of the new year. Estimates of present production run all the way from 65 per cent to 100 per cent of normal. Reports of salesmen of the **National Lead Company** indicate that demand will be good at least up to July, said Charles E. Field, manager. This company's output now is approximately normal.

Prediction of big sales, with present production running at

75 to 80 per cent of normal, is made by H. B. Dickinson, a department manager of the **International Nickel Company**.

W. Y. C. Hunt, manager of the **Midland Metal Company**, while asserting that the metal industries in Chicago have not yet quite recovered from the effects of the holidays and of the coming of the new year, declared that he expects good business at least through the first half of the year. He estimates his company's present output at 80 per cent of normal.

Business is good now and may improve during the next few months, R. G. Raphael, sales manager of the **Great Western Smelting and Refining Company**, says. He declared the production of his company now to be approximately normal and added that orders are coming in nicely.

The metal business will recover quickly from a slight seasonal slump and will be good for several months, W. Friedman, manager of the **Northern Metal Company**, predicts.

Better conditions ahead are seen by George Birkenstein of the **Globe Metal Company**. Mr. Birkenstein believes that business is on a sound basis now and that even a presidential election cannot keep 1924 from being a good year for the industry. The business in lead he declared to be strongest now.

Reports of good business were made by L. R. Atwood, advertising manager of the **Chicago Metal Manufacturing Company**, 3724 South Rockwell street. This Company sustained a severe loss recently in the sudden death of its President, Harry Bennett, but was reorganized and the business has gone ahead without the least change.—L. B. G.

BIRMINGHAM, ENGLAND

December 17, 1923.

The General Election is over and the industrial community, whatever view its various members take of the result, at least knows now where it stands, as far as business is likely to be affected by political conditions. It has been made absolutely clear that the country, by an overwhelming majority, is opposed to a protective tariff. It is possible that on the meeting of Parliament in January events will lead to the formation of a Labor Government though for the present Mr. Baldwin and his colleagues remain in office. But the country has, with equal emphasis, pronounced against the Labor Party's scheme of a levy on capital and other confiscatory proposals. The strong working majority which the Conservatives enjoyed over all other parties before the election has been converted into a minority of a hundred. But it is still the strongest party of the three, Labor coming next and the Liberal Party third. Thus no one of the three parties can carry the government except with the support of one of the others. Extremist economic measures on either side are therefore ruled out. The only factor of disturbance to be feared in the immediate future is another General Election and this all parties, except perhaps the Labor Party, are anxious to avoid.

Rollers of brass and copper tubes have been well occupied during the last few weeks. The resumption of work in the shipyards is beginning to bring in additional business, whilst the increasing activities of the railway companies, following the re-grouping of the systems, are leading to demands for locomotive tubes as well as for a variety of brass foundry required in the construction and fitting up of rolling stock. The sugar refining industry is extending and is providing a good deal of work for tube mills. Inquiries are coming in from all over the world for brass and copper tubes. Indian demands show signs of revival in regard to brass foundry and the 4-inch square copper plates used for making cooking utensils. In the brass trade generally unemployment has almost disappeared, whilst in the most skilled branches there is a shortage of workmen. Electro-platers have had a better Christmas trade than for several years past. But it is restricted mainly to tableware and spoons and forks. A fair amount of business is coming from the British dominions, but demand is chiefly on home account. Birmingham jewelers have at last experienced a revival of business and many men who have been idle for months have resumed work. It remains, however, to be seen whether this means anything more than a stimulus due to the Christmas season. The automobile trade is well provided with orders for the coming year, whilst the bicycle firms have plenty of home and export work, including orders for Japan, where the home production and stocks have suffered from the earthquake. Consequently lamp manufacturers, the aluminum and the makers of motor and cycle parts are occupied and in some instances are working overtime.—C

Business Items — Verified

Hayes Brass Foundry, Inc., is now located at 1624 North Salina street, Syracuse, N. Y.

P. Saldini, manufacturer of white metal castings, has moved from 70 W. 3rd street, to 106 W. 3rd street, New York.

The American Silver Plate Company has opened a shop at 192 East 125th street, New York, to do plating in gold, silver, nickel and bronze.

The Lyndhurst Plating and Polishing Works will occupy the building at 387 Page avenue, Lyndhurst, N. J. They make a specialty of hardware and automobile parts.

Vilter Manufacturing Company, 872 Clinton street, Milwaukee, Wis., operator of a gray iron and brass foundry, is building an addition to its plant for storage purposes.

The Columbia Silica Company, recently incorporated in Akron, Ohio, is erecting a plant for the production of silica sand and sand blast sand. The plant is nearly completed.

The Kawneer Company, Niles, Mich., is erecting a three-story office building 50 x 100 ft. This concern manufactures metal store fronts, metal sash, etc., and operates a polishing and lacquering department.

The Waterbury Buckle Company, Waterbury, Conn., has awarded a general contract to Chatfield & Chatfield, Inc., Waterbury, for the erection of a new one-story addition to be equipped as a japanning works.

The Victoria Metal Company, Erie, Pa., has bought the **N. A. Watson Company** of the same city, manufacturers of steam injectors and steam jet pumps. The Victoria Company manufactures plumbers' brass goods.

Richard Steel Products Company, Battle Creek, Mich., was damaged by fire recently with loss of about \$150,000. The company manufactures automobile engine parts, twist drills, etc., and operates an aluminum foundry.

W. H. Millspaugh, president of the Sandusky Foundry & Machine Company, Sandusky, Ohio, which operates a gray iron, brass and aluminum foundry, has purchased the abandoned plant of the Erie Window Glass Company.

John Polachek Bronze & Iron Company, Long Island City, N. Y., reports contracts during the first nine months of 1923 aggregating \$2,300,000; seven of these contracts amounting to over \$100,000, and nine amounting to over \$50,000.

Fire recently damaged the plant of the **Aluminum Manufacturing Company**, East Moline, Ill. This plant is being rebuilt. This concern operates the following departments: brass, bronze and aluminum foundry, brass machine shop.

American La-France Fire Engine Company, Inc., Elmira, N. Y., has leased a service station in San Francisco, Calif. This concern operates the following departments: brass foundry, brass machine shop, tool room, grinding room, plating, polishing, lacquering.

The firm of **Charles Hardy & Ruperti, Inc.**, 115 Broadway, New York, manufacturer's, dealers and importers of copper and zinc cyanides, carbonates, sulphates and sodium cyanide, has changed its name to **Charles Hardy, Inc.**, and removed its offices to 100 E. 42 street.

The International Silver Company, Center street, Wallingford, Conn., is constructing three one-story buildings, a press room, drop hammer room and annealing room. Estimated cost \$60,000. This concern operates the following departments: cutting-up shop, stamping, polishing.

The Hamlet Sign Works, Hamlet, N. C., are planning the establishment of a new factory to manufacture electric signs and metal parts, etc., to cost close to \$25,000. This concern is in the market for a stamping machine for making press tin signs, such as automobile license plates.

The Calorizing Company, Pittsburgh, Pa., has acquired the exclusive sales rights for Hybnickel, the heat treating alloy perfected by Victor Hybinette. The product will henceforth be known as Calite and Mr. Hybinette will be associated with the company in a consulting capacity.

The Goodeve Bank & Service Company, New Haynes Building, Elkhart, Ind., manufacturer of metal fixtures, etc., has preliminary plans for a new two-story and basement factory at Niagara Falls, New York, 150 x 350 ft., estimated cost \$250,000. Clifford M. Goodeve is president.

Contract has been awarded by the **Pressed Metal Company**, Pawtucket, R. I., for a one-story plant, 107 x 265 to cost \$150,000. The company operates japanning and stamping plants. Officers are Darius Goff, president and treasurer; A. J. Goff, vice-president; F. J. Powers, secretary.

A. P. Swoyer Brass & Copper Company, 233 Broadway, New York, has been organized by A. P. Swoyer who was formerly president of the Baltimore Tube Company and also general sales manager of the Bridgeport Brass Company and head of the A. P. Swoyer Company, Philadelphia, Pa.

The American Tripoli Company, Seneca, Mo., announces the opening of a St. Louis office at 529 Central National Bank Building. Ralph A. Airheart, sales manager, will be in charge. The American Tripoli Company is a subsidiary of the Barns-dell Corporation, New York, makers of "Be Square" products.

The Merchants & Evans Company, Philadelphia, Pa., has opened a branch warehouse in Detroit, located at the corner of Junction and Federal avenues. Officers will be located at 403 Real Estate Building with J. C. McIlroy as manager. This firm operates the following departments: smelting and refining, tinning.

The Minneapolis office of the **Armstrong Cork & Insulation Company** is now located at 316-320 Third avenue, North. These quarters are much larger than the old ones and provide considerably increased warehouse facilities, which will enable the Minneapolis branch to render even better service to the territory it serves.

The Hamilton Metal Products Company, Hamilton, Ohio, will take bids for a two-story and basement addition, 60 x 200 ft., estimated to cost \$50,000 with equipment. George Barkman, Reilly Bldg., is architect. This firm operates the following departments: tool room, cutting-up shop, japanning, stamping, soldering.

The Falstrom Company, Passaic, N. J., maker of sheet metal products, has opened a New York office at 198 Broadway, in charge of A. B. Jones. This concern operates the following departments: tool room, galvanizing, brazing, tinning, soldering. The above company is in the market for galvanizing equipment.

Philadelphia Rust-Proof Company, Howard & Montgomery avenues, Philadelphia, Pa., has completed installing its Parkerizing equipment and is now supplying Parkerizing service to the manufacturers of iron and steel products in the vicinity of Philadelphia. The company also handles any Udylining work for the above city.

The Canadian Bridge Company, Ltd., Walkerville, Ont., Canada, operating a hot dip galvanizing plant in connection with its separate shop for the fabrication of electric transmission towers, has recently made an addition to its galvanizing plant, adding one kettle, so that it now has two kettles holding about 50 tons of zinc each.

The American Bosch Magneto Corporation, Springfield, Mass., has purchased the Star Rebound Controller Company, Cleveland, Ohio, and will manufacture controllers at its Springfield plant. This concern operates the following departments: brass machine shop, tool room, grinding room, plating, stamping, lacquering.

J. Milhenning, Inc., jewelry manufacturer, 135 South State street, Chicago, Ill., has awarded contract for a two-story factory 43 x 120 ft., at 4626-34 Ravenswood avenue, to cost \$48,000. This firm operates the following departments: smelting and refining, tool room, and will be in the market for equipment for its refining room and tool room.

The Goodyear-Zeppelin Corporation, New York, will be organized, following negotiations between the Zeppelin Company of Germany and the Goodyear Tire & Rubber Company, New York, to construct lighter-than-air craft of the Zeppelin type. Within a few weeks an experienced technical staff will be at work in Akron, Ohio, to outline the project.

American Nickeloid Company, Peru, Ill., is building a one-story factory at Walnutport, Pa., to cost approximately \$25,000. This will be considered a branch factory, its main factory and office remaining in Peru. Nickel tin and various other metals now being made here, will be manufactured in the new factory. This is the 25th year of the company.

The **Marx Brass Works**, Detroit, Mich., for the past few years known as the Grant-Marx Brass Works, again is operating under the original firm name, under which it began activities in June 1916, doing business at 688-692 Meldrum avenue. This concern operates the following departments: brass, bronze and aluminum foundry; grinding room, casting shop.

The **Troy Metal Products Company**, Springfield, Ohio, will move its plant to Troy, Ohio, about February 1st, and has purchased the former plant of the McKinnon Dash Company. It manufactures automobile parts and accessories, besides doing general contract work. This firm operates the following departments: brass machine shop, tool room, grinding room, japanning.

The **Johnsonburg Machine Company**, Johnsonburg, Pa., recently incorporated, with \$50,000 capital stock, will operate as machinist and founder in iron, bronze and leading castings, also in pattern making. The company has taken over the plant formerly owned by Burlingame. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, casting shop.

The **Nutley Foundry Company**, Passaic Avenue, Nutley, N. J., manufacturer of brass, bronze and aluminum castings, now is located at its new plant which is about three times the size of its former building. The only loss in the recent fire was that done to a few flasks, boxes, etc. This concern operates the following departments: brass, bronze and aluminum foundry; grinding room, casting shop.

The **Volta Manufacturing Company, Ltd.**, Welland, Ont., Canada, has supplied the Buffalo Bronze Die Cast Corporation, 100 Arthur street, Buffalo, N. Y., with one of its latest type three-phase electric brass furnaces. This furnace has a rated capacity of $\frac{3}{4}$ -tons per heat, and is now being operated on a 24-hour day basis. It is melting an average of 21 heats per day with a current consumption of less than 240 K.W.H. per ton of metal melted.

To develop the De Gama process of briquetting metal borings and turnings, the **American De Gama Process & Machinery Corporation** has been incorporated with headquarters at 347 Madison avenue, New York. The De Gama process was described in September, 1923, issue of THE METAL INDUSTRY. Count D. V. De Gama is president and technical manager. Robert Parkinson, a graduate of the United States Naval Academy, is secretary and treasurer.

The **Ward Heater Company**, 1243 So. Hope street, Los Angeles, Calif., manufacturer of gas furnaces and heaters, is having plans drawn for new works consisting of foundry, plating works, assembling shop and other buildings, estimated to cost \$250,000 with machinery. This concern operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, grinding room, casting shop, cutting-up shop, plating, soldering, polishing.

The **West Haven Foundry Company**, 27 Kimberly avenue, West Haven, Conn., is building a new foundry to be completed about January 1st, to be equipped for the manufacture of brass, bronze, aluminum, nickel, silver and all kinds of non-ferrous castings. The temporary office in charge of W. G. Shutter, is at 17 Lester street, West Haven. The company will engage in a general jobbing business. This firm operates the following departments: brass, bronze and aluminum foundry, grinding room.

The **General Electric Company** and the **Wm. Cramp & Sons Ship & Engine Building Company** have installed the world's largest hydro-electric power unit at Niagara Falls, N. Y., in the new power plant of the Niagara Falls Power Company on the American side of the Niagara River. The generating unit is a 65,000 kw-a. 107 r.p.m., 12,000 volt, 25 cycle vertical waterwheel driven generator, driven by a 70,000 h. p. hydraulic turbine, with a total weight of over 1,750 tons. It is the first of two such units now being installed by these companies.

The **General Electric Company**, Schenectady, N. Y., has purchased at Los Angeles, Calif., five acres on the southwest corner of Santa Fe avenue and 52nd street, with a frontage of 420 ft. on Santa Fe avenue and 520 ft. on 52nd street. There is now located on the property a two-story reinforced concrete building which will immediately be modified and converted into a fully equipped service shop in which all kinds

of electrical apparatus will be rebuilt and repaired. Later a large warehouse will be built on the property and eventually there will probably be a factory.

NEW CLEANER MANUFACTURING COMPANY

The **Magnuson Products Corporation** located at 410 Third Avenue, Brooklyn, N. Y., has been incorporated under the laws of the State of New York, having been in operation since October 6, 1923. The president, Edward Magnuson, has had many years of experience in the manufacture and demonstration of industrial cleaners of all descriptions and is well known throughout the metal and plating trades, having demonstrated in some of the largest plants in the country and in many instances originating special formulas where standard cleaners would not meet the requirements. It is stated that he has surrounded himself with those who likewise had had broad experience in the solution of cleansing problems.

The materials made are known by the trade name of XCEL CLEANSERS.

The factory has at the present time an area of 10,800 square feet. Up-to-date mixing machinery and automatic raw material feed controls are in operation, to insure uniformity of product.

BUSINESS TROUBLES

A meeting of the creditors of **McNab & Harlin Manufacturing Company** was held at the offices of S. D. Leidesdorf, Receiver, on the 25th floor of the Pershing Square Building, 125 Park avenue, New York City, December 27, 1923, for the purpose of receiving the report of the receiver and to discuss the future of the business of the company.

The trustees of **General Platers Supply Company, Inc.**, New York City, have collected and deposited the sum of \$795.47. This deposit was levied upon by the United States Government by a writ of seizure upon the claim that General Platers Supply Company, Inc., was in default in the balance of some \$8,000 income tax for the year 1917. The trustees prosecuted an action instituted by the corporation against G. W. Kyle, its former president for the sum of \$1,900 claimed to have been converted. A judgment in favor of the corporation was rendered against Mr. Kyle in January, 1923, but the trustees have not succeeded in collecting said judgment or any part thereof. According to Mr. Kyle, the corporation is in debt to him for a considerably greater amount, the facts not having been brought out during the suit.

COPPER ASSOCIATION REDUCED

Following a meeting January 2, 1924, the Copper Export Association, announced that the Kennecott interests, the American Smelting and Refining Company and the Phelps-Dodge Corporation had withdrawn from membership, effective as of Feb. 1. No reason for the withdrawals was contained in the statement issued by R. L. Agassiz, president of the Association and president of the Calumet and Hecla Mining Company, who, it is understood, will continue as the Association's head.

The announcement was interpreted as a denial of reports that the association would disband. The withdrawals leave it with about 55 per cent. of its old membership and necessitate a readjustment of its directorate.

Among interests which retain membership are the Anaconda Copper Mining Company with its affiliated companies, the Inspiration Consolidated Copper Company, the Chile Exploration Company and the Calumet and Hecla Consolidated Copper Company.—New York Times.

ANNUAL OAKITE SALES CONFERENCE

The seventh annual sales conference of the Oakley Chemical Company was held in New York, Dec. 3, 4 and 5. The 70 members of its field organization reported. In the three days seven sessions were given over to papers and discussions on the selling methods of the company and to its handling of the cleaning prob-

lems. Four of the papers related to the metal working industries. Tuesday night, Dec. 4, was devoted to entertainment and Wednesday night to the annual banquet. C. F. Radley, editor of the Oakite News Service, was the toastmaster. Among the features were the presentation of prizes for the best story written by a salesman on "My Most Difficult Sale." Addresses were made by David C. Ball, president of the company; Daniel C. Smith, vice-president; David S. Ball, assistant manager, and Fred A. Aston, senior district manager.

CENSUS BUREAU STATISTICS

The Bureau of the Census is now engaged in collecting statistics of manufacturers covering the calendar year 1923. These statistics are compiled in accordance with the Act of Congress of March 3, 1919, and the schedules have been prepared after conference with the associations and others interested in the various industries. The schedules were mailed to the manufacturers on January 2 and the Director of the Census is very anxious to publish the statistics at the earliest possible date in order that they may be of the greatest possible commercial value. The manufacturers engaged in the metal industry are urgently requested to forward their reports to the bureau at the earliest possible date, preferably before the end of January. The bureau has agreed to tabulate the results as rapidly as the schedules are received and publish the totals within a few days after the receipt of the last report.

The Bureau has been co-operating very closely with the industry and desires to be of service; manufacturers should in turn show our appreciation by complying with the request of the director to mail our reports promptly. If the reports are not made by mail it will be necessary for the Government to go to the expense of sending a special agent to the various establishments. It is hoped that all engaged in the metal industry will heartily co-operate and make their reports promptly.

BRISTOL BRASS STATEMENT

Notices have been sent out to the stockholders of the Bristol Brass Corporation, containing the status of the business, the company stating in its communication that it has been receiving numerous inquiries regarding the condition of the business. A table of profits and losses during the past few years is given, the figures being before dividends, and after taxes, have been paid. During 1916, according to the figures, the company made profits of over half a million, the exact figures being \$542,084.08. In 1917, the profits were \$444,977.71, and in 1918, a drop to \$20,864.19. The profits shot up again in 1919, being \$165,976.55, and in 1920 the profits were \$95,498.49. During the business slump of 1921, the company suffered a loss of \$348,827.93, and in 1922, a loss of \$136,438.66. For the ten months of 1923, the profits have been \$77,676.35.

TRADE PUBLICATIONS

Eldorado Pencils. A sheet issued by the Joseph Dixon Crucible Company, Jersey City, N. J.

Spartan Type Metals. An illustrated sheet, issued by Merchant & Evans Company, Philadelphia, Pa.

Economy Cutters—high speed steel cutters for machine shop work. Economy Products Company, Newark, N. J.

Crystal Metal. A folder issued by the Frederic B. Stevens Company, Detroit, Mich., on crystal metal jack stars.

Beaver Pebs. A folder on a metal polishing material, issued by Hanson & Van Winkle Company, Newark, N. J.

Rotary Brush. A card from the J. W. Paxson Company, Philadelphia, Pa., on rotary brushes with air or electric motors.

Observations on an Outstanding American Industry—Cement, by Edward Hungerford, published by Portland Cement Association, Chicago, Ill.

Aero Metal. A pamphlet issued by Garford Foundries Company, Elyria, Ohio, on their light, strong and non-corrosive metal.

Sherardizing. A folder issued by the New Haven Sherardizing Company, Hartford, Conn., describing their facilities for doing job sherardizing.

Rivet Heating Furnace. Mirc's oil fired portable rivet heating furnace is described in a folder by F. J. Ryan & Company, Philadelphia, Pa.

Wire Forming Machines. A booklet from the Baird Machine Company, Bridgeport, Conn., illustrating and describing its wire forming and other machinery.

Side Handle Drill. Bulletin No. 106-A from the Hisey-Wolf Machine Company, Cincinnati, Ohio, describing their high speed portable side handle drill up to 5/16" capacity.

Moving Cathode Apparatus. A folder issued by the U. S. Galvanizing & Plating Corporation, Brooklyn, N. Y., on their new plating equipment in which the cathode is kept moving.

Cost Data Time Studies. A folder on equipment for this purpose issued by Stein & Ellbogen Company, Chicago, Ill. This includes the Hough time study board, stop watches, etc.

Baking Japan and Enamel. Bulletin No. 14, issued by Drying Systems, Inc., Chicago, Ill., describing their method of baking japan and enamel by means of washed and heated air.

Welding, Cutting and Lighting Apparatus. Booklets issued by Alexander Milburn Company, Baltimore, Md., covering its equipment for oxy-acetylene welding, cutting lanterns for night operations.

Pneumatic Die Cushions for Power Presses—Catalogue No. 3, issued by Marquette Tool & Manufacturing Company, Chicago, Ill. A complete, well illustrated and attractive catalogue of 129 pages on pneumatic die cushions for sheet metal drawing and forming, and other products made by this company.

Plating Equipment. A catalogue soon to be issued by Walter C. Gold, Philadelphia, Pa. This catalogue will be 6 x 9 inches, 294 pages, 287 illustrations. This firm believes that it will be one of the most comprehensive in the industry of grinding, polishing and plating materials. It will contain much information and data of interest to progressive grinders, polishers and platers, as well as for the purchasers of the materials necessary in the accomplishment of first class work.

CALENDARS

A number of attractively designed and illustrated calendars have been received, from the following companies:

Crown Rheostat and Supply Company, Chicago, Ill.

Link-Belt Company, Chicago, Ill.

National Engineering Company, Chicago, Ill.

New York Life Insurance Company, Frederick Norton, Agent, New York.

S. W. Paxson Company, Philadelphia, Pa.

Southwark Foundry and Machine Company, Philadelphia, Pa.

Standard Rolling Mills, Inc., Brooklyn, N. Y.

West Virginia Pulp & Paper Company, New York.

Blake Manufacturing Company, Springfield, Mass.

The American Brass Company has issued a calendar of unusual beauty and utility. It consists of an etched sheet brass backing 10 1/2" x 19", colored in green. A very attractive paper filler with three months per sheet is attached.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America.....	\$100	\$510	\$550
American Hardware Corporation.....	100	64	65
Anaconda Copper	50	37 7/8	38 1/4
Bristol Brass	25	5	8
International Nickel, com.	25	13 5/8	13 1/4
International Nickel, pfd.	100	79 1/2	81
International Silver, com.	100	55	70
International Silver, pfd.	100	105	110
National Enameling & Stamping.....	100	40 1/2	41
National Lead Company, com.	100	145 1/4	145 1/2
National Lead Company, pfd.	100	112 1/2	113 1/2
New Jersey Zinc.....	100	144	148
Rome Brass & Copper.....	100	115	125
Scovill Manufacturing Company, new.	220	230	
Yale & Towne Mfg. Company, new.	65	66	

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President, Whitehead Metal Products Company, Inc., of New York

December passes into the records as an uneventful month. Nothing happened by way of price changes or unusual activity in any part of the brass and copper industry. The mills appear to be well satisfied with the year that has just closed. It is believed that most, if not all of them, have had a satisfactory year from a profit standpoint and some of them admit that they have made a good return on their capital investment.

All attention is now focused on the coming year and the prospects as they now appear. There is a general feeling of optimism throughout the trade and a definite idea prevails that the coming year will be a good one. Some mills are expanding their facilities and taking on new lines. Consumers are not committed for any heavy quantities, nor are there any excess stocks hanging over the market. There is a slight weakness in ingot copper, but, this is not regarded seriously nor expected to

have any immediate effect on fabricated brass, copper or nickel silver. Should ingot copper prices be lowered to any greater extent there may be a readjustment of brass and copper schedules but this is not generally anticipated in view of the low price obtaining at the present time.

Manufacturers of nickel silver and other nickel alloys have expressed satisfaction with their showing for the past year. Although there has been some slackening in demand for these materials in the past month or two, the fabricators are not disturbed and view the future with confidence.

Final arrangements have been made by the International Nickel Company to place a stock of pure nickel sheet and rods in the hands of their distributors beginning in January. This marks the final step in placing pure nickel products at the disposal of the trade.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Conditions of the copper market are not as steady as they were a few weeks ago. Trade demand fell off in December, and purchases were distinctly slack during the last half of the month. Imports of copper were extraordinarily large in 1923, and the market has developed a weaker tendency owing to being overstocked with foreign products.

The year 1923 opened with a favorable outlook prevailing in trade circles. The price was around 14½ cents. Buying developed on a large scale and the market displayed both strength and activity which finally lifted quotations to 17½ cents in March. This was the high peak on last year's movement. From that level reaction set in and the market thereafter showed gradual recessions until the sagging tendency culminated in a drop to 21½ cents in October. Since that time prices have fluctuated between 12½ and 13½ cents, the year closing dull at 12½ to 13 cents for prompt electrolytic.

Government statistics show a production of new refined copper derived from domestic and imported material amounted to 2,118,000,000 pounds in 1923, as compared with 1,359,000,000 pounds in 1922, an increase of 759,000,000 pounds. Stocks of refined copper in first hands on December 31, 1923, were estimated at about 256,000,000 pounds, as against 216,000,000 pounds on December 31, 1922, an increase in surplus stocks of 40,000,000 pounds. Exports in 1923 amounted to 773,000,000 pounds, compared with 705,000,000 pounds in 1922. Domestic consumption last year was at the apparent rate of 1,305,000,000 pounds and compared with 897,000,000 pounds in 1922, a difference of 408,000,000 pounds between two successive years.

ZINC

Trade was comparatively quiet in zinc last month, but price fluctuations were confined to narrow limits. Present prices are 6.62½c New York and 6.67½c St. Louis basis for prime western slabs. According to compilation made for Geological Survey the recoverable zinc content of ore mined in 1923 was about 623,000 tons, as compared with 472,184 tons in 1922. The output of primary metallic zinc from domestic and foreign ores was about 487,000 tons, as against 354,277 tons in 1922. The apparent consumption of primary zinc in 1923 was about 427,000 tons as compared with 373,094 tons in 1922 and 203,600 tons in 1921. The United States increased its output of slab zinc in 1923 by 120,000 tons and Belgium increased its output of slab zinc by 33,000 tons. The average price quoted per pound for prime western zinc for immediate delivery at St. Louis in 1923 was slightly under 6.7 cents, as compared with an average for all grades in 1922 of 5.7 cents. Exports of slab zinc in 1923 are estimated at 50,509 tons, against 33,503 tons in 1922.

TIN

The tin market is still sustained by excellent consuming demand and the unusually strong statistical position. Transactions in December for domestic account were large, and the volume of orders in the local market furnished much support to the high price levels maintained both here and abroad.

The new year opened with total visible supply of tin at 21,011 tons, as compared with 25,000 tons at the beginning of 1923. United States consumption of tin in 1923, including American product, taking deliveries as basis, was about 74,500 tons, estimated at about 8,000 tons over 1922 figures.

Production of tin in 1923 was well below consumption. The East continued to sell freely, and had it not been for regular liquidation of reserve stocks to the extent of nearly 8,000 tons, the situation would have probably been embarrassed by a scarcity of supplies. Excess consumption over output in 1923 is estimated at about 12,000 tons. The position of the market is therefore considered sound. Consumption is maintained at a high rate and there is no sign of any diminution in demand. The December statistics showed an increase in visible supply of 1,491 tons over the November figures, but this is not regarded as other than a temporary condition. As we close our report the market is firm at 46½ to 47c for Straits tin. Market changes in 1923 covered a wide range. The opening was on the basis of 39c, and the high point was 51½c in March, with a low of 37½c during the summer. The average price for the whole year was 42.71c, against an average of 32.58c for 1922.

LEAD

Extremely favorable conditions for market firmness have existed in the lead situation for many weeks. The leading producer advanced price about the end of December to 7½ cents New York basis, but the outside market was distinctly strong at 8c to 8½c.

The total lead smelted or refined in the United States in 1923 is officially reported at about 615,000 tons, as compared with 532,662 tons in 1922. The imports of refined pig lead in first eleven months of 1923 were 21,065 tons, as compared with 3,551 tons in the whole of 1922. Quantity available for consumption in the United States was 581,000 tons, as against 492,705 in 1922 and 444,872 in 1921.

Average quoted price of lead for prompt delivery at New York for the year was about 7.5 cents a pound, as compared with an average selling price of 5.5 cents in 1922. At the beginning of 1923 the price was 7.3 cents, rising to 8.6 cents in March but dropping to 6 cents by the middle of July. At the end of 1923 lead was selling for about 8c to 8½c a pound in the outside market. On January 2, 1924, the American Smelting & Refining Co. advanced the price of lead to 7.75c New York. The outside market on same date was quoted at 7.90c to 8.10c at St. Louis, and 8.20c to 8.40c New York for prompt shipment. It is believed domestic consumption last year reached a new high record.

ALUMINUM

Prices on ingot aluminum of virgin quality have hardened slightly to 27 $\frac{1}{4}$ c to 28 $\frac{1}{4}$ c for 99% plus, and 27 $\frac{1}{4}$ c to 27 $\frac{3}{4}$ c for 98-99% grade. Buying for 1924 requirements on a large scale has not developed yet, but if conditions in the automotive industry continues good demand is expected to improve. Consumers are due to come into the market this month, and developments the next few weeks are awaited with considerable interest.

ANTIMONY

The new year opens up with a firm market for antimony. Spot regulus is held at 9½c to 10c, duty paid. There were recent offers from China for nearby shipment at 7½c c. i. f. New York, in bond, but holders are inclined to raise price. Quantity afloat and for early shipment appears to be limited.

QUICKSILVER

Demand for quicksilver has been rather slack for some time. Recent purchases are to cover current requirements, and there is not sufficient activity to affect prices in a definite way. Present quotations in the domestic market are \$60 to \$61 per flask.

PLATINUM

The market has fully maintained the firm tone established a few weeks ago of \$125 per ounce for refined platinum. Small lots have been quoted at a higher price, and there is considerable display of firmness among sellers.

SILVER

Movements of silver in 1923 were in large volume. It is estimated that demand from China and India on this country this year will amount to more than 85,000,000 ounces, as compared with 66,000,000 ounces in 1922. Stocks of silver at Shanghai are considered comparatively small for this time of year. Imports of silver into this country during the first 11 months of 1923 were

101,500,000 ounces, as compared with 103,500,000 ounces for the whole of 1922. Exports from United States for first 11 months of 1923 were 96,250,000 ounces, compared with 92,000,000 for the 12 months of 1922. Range of prices for silver bullion in 1923 was 68½¢ high and 62¾¢ low. The January opening this year was 64¾¢. The United States Government purchased nearly 50,000,000 ounces of domestic silver during the first 6 months of 1923. American silver producers are to hold an important meeting at Salt Lake City in this month.

OLD METALS

Cautious buying and trading on comparatively small scale have been features lately in this market. Dealers have accumulated enough material to keep customers supplied, but in the midst of stock-taking period there is seasonal falling off in demand. The last few weeks have been marked by market dullness and actual trading is restricted to filling the few current orders which come along. Buying prices quote 11½c to 11¾c for crucible copper of best quality, 9½c to 9¾c for light copper, 5c to 5½c for light clean brass. Low brass clippings bring from 8c to 8½c, aluminum clippings 19c to 19½c, heavy lead 6½c to 6¾c, new zinc scrap 4½c to 4¾c, and battery lead 3¾c to 4¾c.

WATERBURY AVERAGE

Lake Copper—Average for 1922, 13.844—January, 1923, 14.875—February, 15.75—March, 17.25—April, 17.125—May, 16.125—June, 15.25—July, 15.00—August, 14.50—September, 14.00—October, 13.25—November, 13.375—December, 13.25.

Brass Mill Zinc—Average for 1922, 6.283—January, 1923, 8.00—February, 8—March, 8.70—April, 8.25—May, 7.60—June, 7.00—July, 6.80—August, 7.10—September, 7.30—October, 7.10—November, 6.80—December, 7.10.

Daily Metal Prices for the Month of December, 1923

Record of Daily Highest, Lowest and Average

Metal Prices for January 14

Metal Prices, January 14, 1924

INGOT METALS AND ALLOYS

Brass Ingot, Yellow.....	9½ to 11
Brass Ingots, Red.....	11½ to 13½
Bronze Ingot.....	13 to 14
Bismuth.....	\$2.55
Cadmium.....	80 to 85
Casting Aluminum Alloys.....	21 to 24
Cobalt—97% pure.....	\$3.00
Manganese Bronze Castings.....	22 to 35
Manganese Bronze Ingots.....	13 to 16
Manganese Bronze Forging.....	33 to 42
Manganese Copper, 30%.....	28 to 45
Magnesium Metal.....	\$1.25-1.50
Parsons Manganese Bronze Ingots.....	17½ to 19
Phosphor Bronze.....	24 to 30
Phosphor Copper, guaranteed 15%.....	18 to 21
Phosphor Copper, guaranteed 10%.....	17½ to 21
Phosphor Tin, guaranteed 5%.....	55 to 60
Phosphor Tin, no guarantee.....	52 to 58
Quicksilver.....	\$60
Silicon Copper, 10%.....	according to quantity 28 to 35

OLD METALS

Buying Prices	Selling Prices
11 to 11½ Heavy Cut Copper.....	12½ to 13
10½ to 10¾ Copper Wire.....	12 to 12½
9 to 9½ Light Copper.....	10½ to 10¾
9 to 9½ Heavy Machine Comp.....	10½ to 11
6½ to 6¾ Heavy Brass.....	8½ to 9
5 to 5½ Light Brass.....	6½ to 6¾
6½ to 6¾ No. 1 Yellow Brass Turnings.....	7½ to 8½
8½ to 8¾ No. 1 Comp Turnings.....	9 to 9½
5½ to 6¾ Heavy Lead.....	6½ to 6¾
2½ to 3½ Zinc Scrap.....	3½ to 4½
8½ to 8¾ Scrap Aluminum Turnings.....	10½ to 11½
14½ to 14¾ Scrap Aluminum, cast alloyed.....	16½ to 16¾
15½ to 16¾ Scrap Aluminum, sheet (new).....	17½ to 18½
22½ No. 1 Pewter.....	26½
13½ Old Nickel anodes.....	15½
21½ to 23½ Old Nickel.....	25½ to 27½

BRASS MATERIAL—MILL SHIPMENTS

In effect Nov. 13, 1923

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet.....	\$0.17½	\$0.19½	\$0.21½
Wire.....	0.18½	0.20	0.21½
Rod.....	0.15½	0.20½	0.22
Brazed tubing.....	0.25½	.....	0.31
Open seam tubing.....	0.25½	.....	0.31
Angles and channels.....	0.28½	.....	0.34

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet.....	\$0.18½	\$0.20½	\$0.22½
Wire.....	0.19½	0.21	0.22½
Rod.....	0.16½	0.21½	0.23
Brazed tubing.....	0.26½	.....	0.32
Open seam tubing.....	0.26½	.....	0.32
Angles and channels.....	0.29½	.....	0.35

SEAMLESS TUBING

Brass, 22c. to 23c. per lb. base.

Copper, 23½c. to 24½c. per lb. base.

TOBIN BRONZE AND MUNZ METAL

Tobin Bronze Rod.....	19½c. net base
Muntz or Yellow Metal Sheathing (14" x 48").....	17½c. net base
Muntz or Yellow Rectangular Sheets other Sheathing.....	18½c. net base

Muntz or Yellow Metal Rod..... 15½c. net base
Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)..... 21c. to 22c.
From stock..... 22c. to 23c.

BARE COPPER WIRE—CARLOAD LOTS

15½c. to 16c. per lb. base.

SOLDERING COPERS

300 lbs. and over in one order..... 19½c. per lb. base
100 lbs. to 200 lbs. in one order..... 20½c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.
Carload lots, standard sizes and gauges, at mill, 9½c. basis less
8 per cent. discount.
Casks, jobbers' prices..... 11c. to 11½c.
Open casks, jobbers' prices..... 11½c to 12½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price..... 37c.
Aluminum coils, 24 ga. and heavier, base price..... 35c.
Foreign..... 38-40c.

NICKEL SILVER (NICKELENE)

Base Prices	
Grade "A" Nickel Silver Sheet Metal	
10% Quality	25½c. per lb.
15% "	26½c. per lb.
18% "	28c. per lb.
Nickel Silver Wire and Rod	
10% "	28½c. per lb.
15% "	32c. per lb.
18% "	35c. per lb.

MONEL METAL

Shot..... 32
Blocks..... 32
Hot Rolled Rods (base)..... 40
Cold Drawn Rods (base)..... 48
Hot Rolled Sheets (base)..... 42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheets—18" wide or less. No. 26 B. & S. Gauge or
thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c.
over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or
thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500
lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs.,
20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

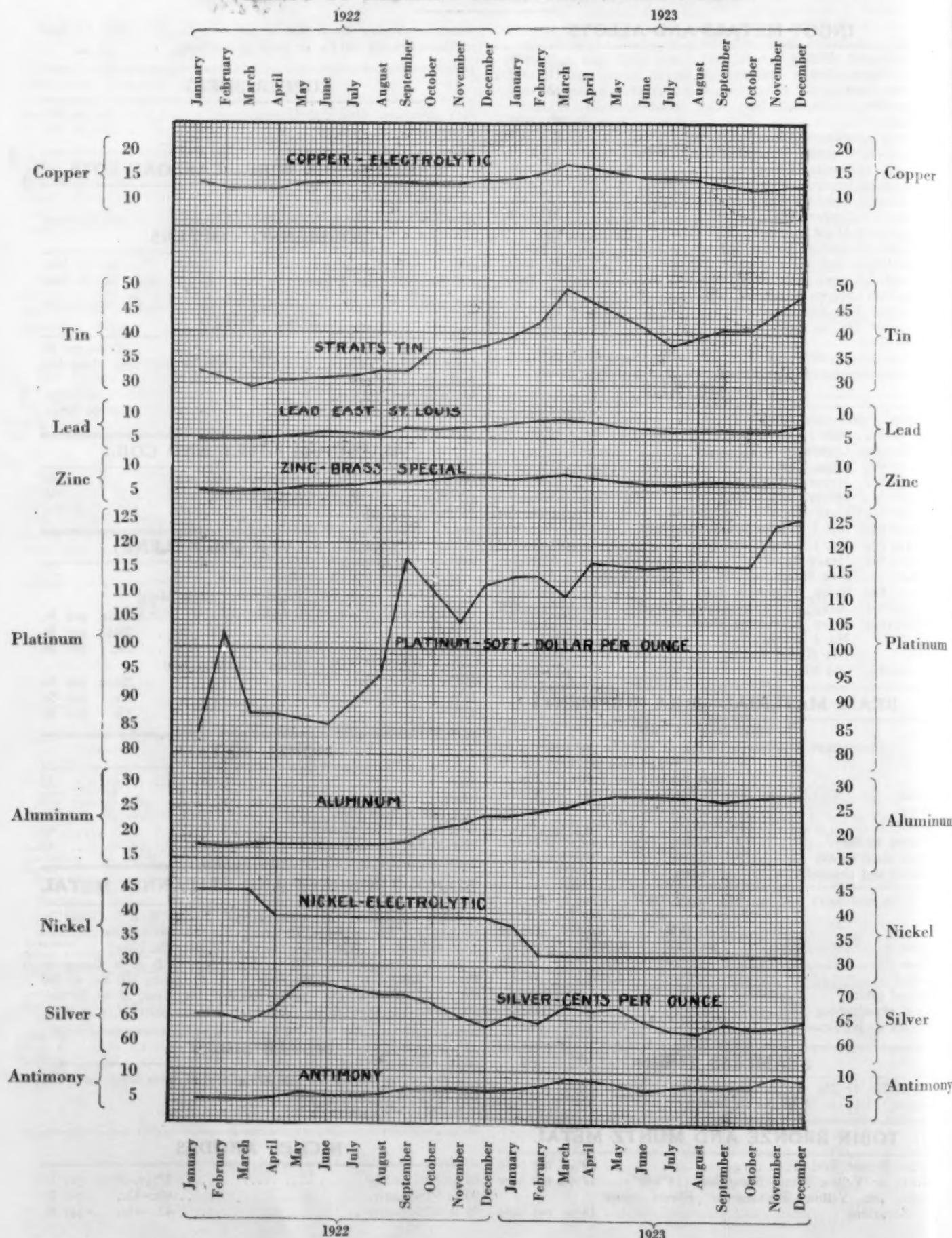
Rolled silver anodes .999 fine are quoted at from 67½c. to 69½c.
per Troy ounce, depending upon quantity.

Rolled sterling silver 65½c. to 67½c.

NICKEL ANODES

85 to 87% purity..... 37½c.-39½c. per lb.
90 to 92% purity..... 40c.-42c. per lb.
95 to 97% purity..... 42c.-44c. per lb.

Chart of Metal Prices for 1922-1923



Pig Iron and Metal Products of the United States

Calendar Years 1914-1922. (1923 Estimated.)
(FROM THE UNITED STATES GEOLOGICAL SURVEY.)

PRODUCTS METALLIC	1914		1915		1916		Products
	Quantity	Value	Quantity	Value	Quantity	Value	
Pig iron (spot value), long tons....	22,263,263	\$298,777,429	30,384,486	\$401,409,604	39,126,324	\$663,478,118	Pig iron
Silver, commercial value, troy ounces.	72,455,100	40,067,700	74,961,075	37,397,300	74,414,802	48,953,000	Silver
Gold, coining value, troy ounces.....	4,572,976	94,531,800	4,887,602	101,035,700	4,479,056	92,590,300	Gold
Copper, value at New York, pounds..	1,150,137,192	152,968,000	1,388,009,527	242,902,000	1,927,850,548	474,288,000	Copper
Lead (refined) New York, short tons	512,794	39,998,000	507,026	47,660,000	552,228	76,207,000	Lead
Zinc, value at St. Louis, short tons (g).	343,418	35,029,000	458,135	113,617,000	564,338	151,243,000	Zinc
Quicksilver, value at S. Fran., flasks.	16,548	811,680	21,033	1,804,631	29,932	3,768,139	Quicksilver
Aluminum, pounds	*	10,080,000	*	16,280,000	*	33,900,000	Aluminum
Antimonial lead, short tons.....	16,667	1,572,167	23,224	3,665,736	24,038	4,483,582	Antim. Lead
Nickel, value at New York, short tons	423	313,000	822	538,222	918	671,192	Nickel
Tin, short tons	104	66,560	102	78,846	140	122,000	Tin
Platinum, New York City, troy oz...	6,324	280,885	8,665	478,688	28,088	2,301,762	Platinum
Total value of metallic products (approximate) (b)		\$686,639,000		\$991,730,000		\$1,620,745,000	
PRODUCTS METALLIC	1917		1918		1919		Products
	Quantity	Value	Quantity	Value	Quantity	Value	
Pig iron (spot value), long tons....	38,612,546	\$1,053,785,975	38,230,440	\$1,180,759,565	30,130,231	\$775,915,043	Pig iron
Silver, commercial value, troy ounces.	71,740,362	59,078,100	67,810,139	66,485,129	56,682,445	63,533,652	Silver
Gold, coining value, troy ounces.....	4,051,440	83,750,700	3,320,784	68,646,700	2,918,628	60,333,400	Gold
Copper, sales value, pounds.....	1,886,120,721	514,911,000	1,908,533,595	471,408,000	1,286,419,329	239,274,000	Copper
Lead (ref.) New York, short tons (h)	548,450	94,333,000	539,905	76,667,000	424,433	44,990,000	Lead
Zinc, sales value, short tons.....	584,597	119,258,000	492,405	89,618,000	452,272	66,032,000	Zinc
Quicksilver, value at S. Fran., flasks.	36,159	3,808,266	32,883	3,863,752	21,415	1,933,560	Quicksilver
Aluminum, pounds	*	45,882,000	*	41,159,000	*	38,558,000	Aluminum
Antimonial lead, short tons.....	18,646	3,781,560	18,570	2,826,350	13,874	1,513,968	Antim. Lead
Nickel, value at New York, short tons	402	331,556	441	401,000	511	434,485	Nickel
Tin, short tons	110	135,600	69	118,500	56	73,400	Tin
Platinum and allied metals, value at New York City, troy ounces.....	38,831	4,023,757	59,753	6,417,980	45,109	5,614,335	Platinum
Total value of metallic products (approximate) (b)		\$2,086,234,000		\$2,153,318,000		\$1,351,600,000	
PRODUCTS METALLIC	1920		1921		1922		Products
	Quantity	Value	Quantity	Value	Quantity	Value	
Pig iron (spot value), long tons....	35,710,227	\$1,140,904,096	16,038,619	\$389,437,792	27,670,738	\$608,144,858	Pig iron
Silver, commercial value, troy ounces.	55,361,573	60,801,955	53,052,441	53,052,441	56,240,048	56,240,048	Silver
Gold, coining value, troy ounces.....	2,476,166	51,186,900	2,422,006	50,067,300	2,363,075	48,849,100	Gold
Copper, sales value, pounds.....	1,209,061,040	222,467,000	505,586,098	65,221,000	950,285,947	128,289,000	Copper
Lead (refined) sales value, short tons.	476,849	76,296,000	398,222	35,840,000	468,746	51,562,000	Lead
Zinc, sales value, short tons.....	450,045	72,907,000	198,232	19,823,000	353,274	40,273,000	Zinc
Quicksilver, value at S. Fran., flasks.	13,392	1,066,807	6,339	300,595	6,375	368,348	Quicksilver
Aluminum, pounds	*	41,375,000	*	10,906,000	*	13,622,000	Aluminum
Antimonial lead, short tons.....	12,535	1,963,255	10,064	870,059	8,075	844,993	Antim. Lead
Nickel, value at New York, short tons	365	293,250	111	86,000	208	133,191	Nickel
Tin, short tons	22	22,000	4	2,400	1	912	Tin
Platinum and allied metals, value at New York City, troy ounces.....	41,544	4,697,722	56,370	4,238,989	57,718	5,860,525	Platinum
Total value of metallic products (approximate) (b)		\$1,724,300,000		\$656,000,000		\$954,187,975	

1923 ESTIMATED†

	Quantity	Value	
	Total	Per Unit	
Pig iron, tons	40,250,000 (f)	\$1,164,835	\$28.94 (a)
Copper, pounds	2,306,000,000	332,525,200	14.42c
Gold, ounces, fine	2,485,445	51,378,700	\$20
Antimonial lead, short tons.....	15,800	(i)	(i)
Lead, short tons (foreign and domestic)	645,300	93,787,902	\$145.34 (c)
Zinc, short tons	487,000	64,252,180	132.14 (d)
Quicksilver, flasks	(i)	(i)	66.50 (c)
Silver, ounces, fine	72,611,200	59,541,184	64.87c
Tin, pounds (imports)	156,000,000	\$66,549,600	42.66c (e)

(i) Figures not available.

(†) Figures from Engineering and Mining Journal.
(b) Includes some items of minor interest to metal trades not shown in table.

(*) Survey not at liberty to publish figures.

(a) Bessemer.

(e) Straits.

(f) Iron Age.

(g) Beginning with 1915, value based on average sales price.

(h) Beginning with 1917, value based on average sales price.

Supply Prices, January 14, 1924

CHEMICALS

In Commercial Quantities—New York Prices		
Acetone	lb.	.24½-.27
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.45-.50
Denatured in bbls.	gal.	.51-.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech.	lb.	.02½-.03
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech., Barrels	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate		
Borax Crystals (Sodium Borate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green, bbls.	lb.	.39½
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.05½
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	\$30.00
Fluor-spar (Calcic fluoride)	ton	\$75.00
Fusel Oil	gal.	6.75
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate, see Copperas, bbl.	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½-.40
Salts, single bbls.	lb.	.11½
Salts, double, bbl.	lb.	.10½
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.35-.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.09

Potassium Bichromate, casks	lb.	.09¾
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	\$30.00
Rosin, bbls.	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.46¾
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls.	lb.	.06
Cyanide, 96 to 98%, 100 lbs.	lb.	.22
Hypsulphite, kegs	lb.	.04
Nitrate, tech. bbls.	lb.	.03
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass) bbls.	lb.	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone) bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.35
Tripoli	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls.	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.13-.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb.	.37
Sulphate, bbls.	lb.	.03½

COTTON BUFFS

Open buffs, per 100 sections (nominal)		
12 inch, 20 ply, 64/68, cloth	base,	46.50
14 inch, 20 ply, 64/68, cloth	base,	57.80
12 inch, 20 ply, 84/92, cloth	base,	46.20
14 inch, 20 ply, 84/92, cloth	base,	62.25
12 inch, 20 ply, 88/96 cloth	base,	53.50
14 inch, 20 ply, 88/96, cloth	base,	72.10
Sewed Buffs, per lb., bleached and unbleached	base,	.65 to .75

FELT WHEELS

	Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75
" 6" 8" and over 16"	1" to 3"	2.85
" 6" to 24"	Over 3"	3.15
" 6" to 24"	½" to 1"	3.75
" 4" to 6"	¾" to 3"	4.75
" Under 4"	¼" to 3"	5.35
		Any quantity

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.